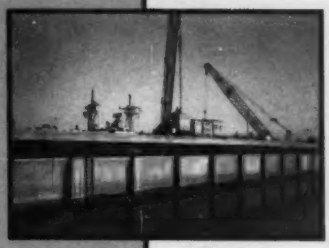
Navy Civil Engineer

Summer 1988

FEATURED INSIDE

Charleston gets double-deck berthing pier—page 2



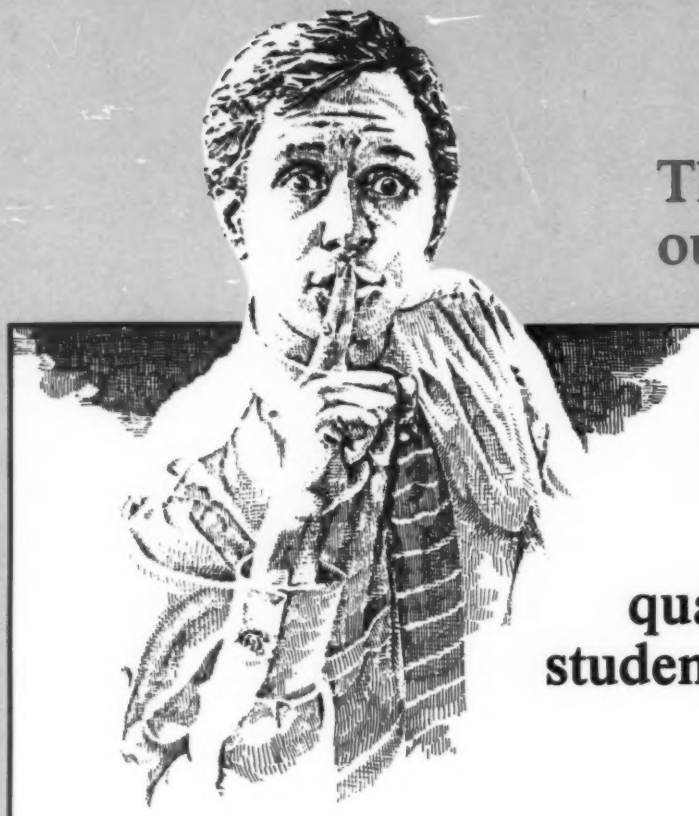
EO1 Yvonne Thomas chosen by NCTC Port Hueneme as Instructor in the Spotlight—page 5

WW I big gun moved to Washington Navy Yard—page 6

Portable bike-like apparatus used to pump fuel into vehicles—page 17

The facts behind the 'asbestos nightmare'—page 22

Major theme this issue: Planning



The secret's out . . .

You can secure your future in the Civil Engineer Corps where qualified engineering students may earn more than $1,000 per month

How to qualify . . .

• Students must be U.S. citizens, between the ages of 19 and 35 years, within 24 months of graduation, and enrolled in an engineering or architecture program . . . • Engineering degrees must be accredited by the Accredition Board for Engineering and Technology (ABET) . . . • Preferred fields of study are civil, mechanical, and electrical engineering. Other ABET-accredited engineering degrees will be considered on a case-by-case basis . . . • Applicants enrolled in architecture must be pursuing study programs generally of five years' duration accredited by the National Architectural Accrediting Board . . . • Must meet current scholastic and physical standards . . . • Upon acceptance in the program, will be placed on active duty as Officer Candidate, Seaman (E-3), prior to receiving their baccalaureate degrees . . . • Upon graduation they will be required to complete Officer Candidate School, Newport, R.I., and the basic course of instruction at the Naval School, Civil Engineer Corps Officers, Port Hueneme, Calif. . . . • Following completion of Officer Candidate School, they will be obligated to remain on active duty for four years.

CALL NOW

800-327-NAVY

Contact your nearest CEC officer

LCdr. Jack Surash,
CEC, USN
NAVFAC, Code 09MA1
200 Stovall Street
Alexandria, VA 22332
Phone (202) 694-3635
AV 224-3635

Lt. (j.g.) Mark Leemaster,
CEC, USNR
WESTDIV, Code 09L1
P.O. Box 727
San Bruno, CA 94066-0720
Phone (415) 877-7103
AV 859-7103

Lt. John Heinzel,
CEC, USN
CHESDIV
Washington Navy Yard
Washington, DC 20374
Phone (202) 433-7285
AV 288-7285

NAVY CIVIL Engineer

SUMMER 1988 Vol. XXVIII, No. 1

FEATURES

Double-deck berthing Pier Zulu now operational in Charleston 2
By Cdr. H. B. Lemon and Jon Sadler
The story behind the Navy's newest and most innovative berthing pier.

When it comes to safety motivation—money talks! 4
By Monroe Billingsley
A new version of safety motivation is described.

WW I big gun goes home to Navy yard 6
By Charles R. Senerius
Author describes the movement of a gun weighing 535,000 pounds to Navy yard.

Does the Navy have Tennis Elbow? 8
By Mark E. Hollan
A new budget act presents a challenge that must be met according to author.

Navy, Army, NASA specs now on CD-ROM 12
Anonymous
New compact disks tells everything.

Geodesic dome in Antarctica threatened by snow movement 13
By Jerry Thomas
Two-mile thick polar ice cap give scientists trouble at South Pole.

Durability: A measure of concrete quality 18
By Lt. Stephen T. Eckel
The durability of concrete mix and how to measure it are discussed.

Newly developed technology permits soft solder fabrication of aluminum 19
By W. L. Falke, L. A. Neumeier and K. W. Mlynarski
It can be done and a new technology is described.

Membership drive underway for Association of CEC officers 21
By Lt. Frank Cantwell
An application form is included with appeal.

The asbestos nightmare: From 'magic mineral' to invisible killer 22
By Lt. Sharon L. Disher
The author offers an historical view of this controversial subject.

Annual Inspection Summary: Management tool for backlog reduction 26
By Bruce D. Crocker
Author tells how AIS can be used as a tool to help public works managers.

BENJAMIN F. MONTOYA
Rear Admiral, CEC, USN
Commander
and
Chief of Civil Engineers
ALAN K. RIFFEY
Captain, CEC, USN
Vice Commander
and
Deputy Chief of Civil Engineers

LES HELSDON
Editor

ANNE-MARIE O'HARA
Assistant Editor

Published quarterly by Naval Facilities Engineering Command, Alexandria, VA 22332.

The *Navy Civil Engineer* (ISSN 0096-9419) is for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20401. Second-class postage paid at Port Hueneme, CA, and additional mailing offices.

Send address changes to publication office: mailing codes B, O, and Z only. All other changes are made through NMPC (active duty and reserve) and FACSO payroll (civilians GS-09 and above) records. The *Navy Civil Engineer*, Code C20M, Naval School, Civil Engineer Corps Officers, Port Hueneme, CA 94043-5002. Tel: (805) 982-3104; Govt. Autovon 360-3104.

Issuance of the *Navy Civil Engineer* (NAVFAC P-330) is approved in accordance with Department of the Navy Publication and Printing Regulations NAVEXOS P-35. It does not alter, amend, or supersede official regulations, orders, or directives. Cost of printing is charged to appropriate funds for maintenance and operations of the Naval Facilities Engineering Command.

The *Navy Civil Engineer* is intended for the information of regular and reserve personnel of the Civil Engineer Corps, United States Navy, and key civilian employees of the Naval Facilities Engineering Command, subordinate commands, and other mission-oriented activities.

DEPARTMENTS

instructor in the spotlight 5
situation report 11
news worth reviewing 16
advice of counsel 25
31 reserve officers graduate CECOS in March 28
index 31

PRODUCTION SCHEDULE

Issue	Theme	Material Due	Distribution Date
WINTER 1988-89	Seabees	Oct. 15, 1988	Jan. 1-15, 1989
SPRING 1989	Contracting	Jan. 15, 1989	April 1-15, 1989
SUMMER 1989	Environment	April 15, 1989	July 1-15, 1989
FALL 1989	Reserves	July 15, 1989	Oct. 1-15, 1989

Double-deck berthing Pier Zulu now operational in Charleston

By CDR H. B. LEMON, CEC, USN
Resident Officer in Charge of Construction
and
JON SADLER
Resident Engineer in Charge of Construction
Southern Division
Naval Facilities Engineering Command
Charleston, S.C.

The Navy's newest and most innovative permanent berthing pier is now operational in Charleston, S.C. Pier Zulu, with its unusual double-deck design, is welcomed by fleet and supporting shore commands. The Naval Station Charleston is the U.S. Navy's third largest homeport, and host to some 75 homeported ships and submarines. Recent growth has crowded existing piers. Pier Zulu will help relieve this overcrowding.

Construction in progress—one of the vaults.

With limited space available, a location between existing Piers L and M was chosen for the siting of the new double-deck Pier Z and associated quay wall. Pier Z was designed to berth as many as eight ships of several different classes. The contract also included the construction of a quay wall between Piers Q and R, which facilitated additional dredging at the head of these piers to create three additional new berths.

Double-decking conserved the required width of the pier, and reduced the congestion normally found on conventional piers by having the transformer housings and utility connections on the lower deck. The upper deck, with 600 pounds per square foot uniform live-load design, can accommodate a 70-ton crane and is kept clear for ship operations. The lower deck is devoted to utilities for efficient use by public works and port services personnel.

This utility deck has four electrical transformer vaults located along the centerline of the pier and vehicle lanes on either side, outboard of which are the easily accessible utility ducts for steam, potable water, salt water, compressed air, oily waste, fuel oil, and the sanitary and electrical connections.

Success of construction can be attributed to several factors: excellence in original design, innovative prime contractor expertise, and well-established communications between contractor superintendent, contractor quality control (CQC) representative, Title II Architect-Engineer (A-E) inspector, assistant resident engineer in charge of construction (AREICC), and Naval Station/Naval Shipyard public works representatives.

Prior to starting construction of the pier, the contractor had to complete construction of the new bulkheads; 560 feet of bulkhead was constructed between Piers L and M and 611 feet of bulkhead was constructed between Piers Q and R. The bulkhead consisted of 75-foot-long sheet pile with 78-foot-long concrete anchor piles. Construction of the bulkhead took approximately one year.

Construction of the pier itself began in September 1985. An innovative design and contractor expertise made construction of a double-deck pier in Charleston possible. Waterfront construction in Charleston is difficult due to the 5- to 7-foot range between high and low tide. The extensive use of precast members and prestressed members enabled the contractor to install the pile caps quickly and within the low-tide time frame of only two to three hours per day with sufficient space provided for

laydown and a precasting yard.

The contractor started the on-site precasting operation soon after construction started on the bulkhead. Once work started on the pier, the contractor had stockpiled enough of the precast components to allow for a smooth continuous operation. Piles up to 90 feet in length were driven through the river mud and 20 feet into the underlying stiff marl to support the pier.

Piles were fabricated in a prestressed concrete yard in downtown Charleston, and transported by barge to the site. The use of precast components in lieu of cast-in-place concrete enabled the contractor to erect up to 60 feet of the pier every two weeks. Such well-planned, systematic, and efficient construction could then proceed from shore to the end of the 1,250-foot pier.

The most interesting and challenging portion of the pier was the construction of the electrical vaults. These vaults are 120 feet long, 25 feet wide, and 15 feet high. The floor of the vault is three feet below mean high tide and the ceiling is the underside of the upper deck.

In order to construct the vaults independent of the tides, the contractor erected a platform to allow construction of the vault floor and the first 5½ feet of the vault walls. A frame was then erected over the vault and jacks set on the frame to raise the vault to allow removal of the platform and then lower the 400-ton vault section onto the pile caps.

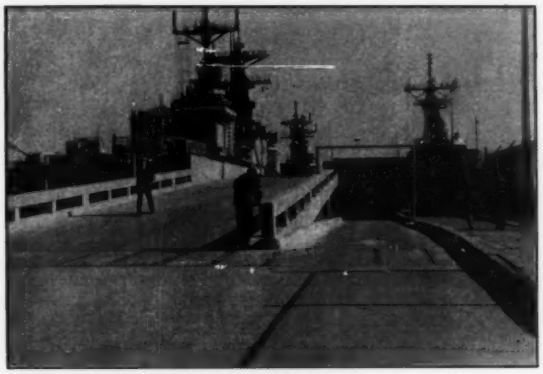
During the removal of the platform for the first vault, with the vault supported by the jacks and half the platform removed from underneath so that the vault could not yet be lowered, there was a tense period while the construction weathered 65 miles per hour winds of a passing hurricane.

Upon the completion of the vault, the electrical subcontractor had little difficulty in installing the electrical gear in the vaults. Conduit was then installed for the primary power and cable trays for the secondary power. Over a quarter of a mile of pile-supported duct bank was installed from a nearby switch station to provide primary power to the pier.

The mechanical subcontractor was able to install the mechanical utilities quickly due to his not being encumbered by the tides, as had been the case on other conventional piers where utility lines are suspended from the underside of the pier. Since the Pier Zulu utilities are in a dry trench along both sides of the pier, the contractor was able to work full days despite tides or weather.

View of the pier from the front.

Construction in progress—the ramp going to upper level.



Side view of the pier.

A major contribution to the success of construction was one that is often key to most of our naval facilities endeavors—good communication! With an estimated equipment labor and field overhead cost of over $20,000 a day at the height of mobilization, any delays would have been very costly. With ship movements in and out of adjacent Piers L and M, and with divers operating within potential damaging range of ship sonars, communication was essential to safety and government efficiency.

In addition to the contractor's weekly safety and progress meetings, and proper submission of utility and facility outage requests required by public works instructions, communications were enhanced by attendance of the assigned AREICC at weekly berthing meetings at Naval Station port services department.

These meetings were also attended by Shipyard public works lead activity pier utilities personnel. They provided important opportunities to provide status of contracor waterfront work, and to coordinate utility and facility outages, outline diving schedules, and to advise all concerned parties of the construction impact to waterfront activities.

As the first pier of its kind, Pier Zulu is being reviewed for its design and constructability for possible application to similar double-deck pile supported pier at several locations on the Gulf Coast. NAVFAC, SOUTHDIV, and ROICC NAVSTA Charleston are justifiably proud of this notable design and construction achievement. □

When it comes to safety motivation—money talks!

By MONROE BILLINGSLEY
Safety Manager
PWC San Diego, Calif.

A new version of safety motivation that could revolutionize mishap prevention efforts within many civilian commands has been introduced at the Navy's Public Works Center (PWC), San Diego. From all early indications, it has plenty of potential. It's a program that awards money each quarter to employees of three production shops for their efforts in mishap prevention.

Safety motivation goes back a long way. Many things have been tried, from awarding pins, plaques, certificates, and public kudos for employees' mishap prevention efforts to oral and written admonishments, suspensions, and removal for employee safety violations.

These actions are motivating factors and can produce desired results when administered in a consistent fashion. All of these means are used at PWC San Diego and, while they do motivate employees to some degree, the desired results are not being realized. This is what spawned the idea of possibly awarding tangible gifts for mishap prevention efforts.

After Capt. Roger Frauenfelder assumed command of PWC San Diego in late summer of 1986, he was concerned enough about mishap rates to ask the safety manager to explore the idea of giving tangible gifts to production shops. From that idea evolved a program called the "Occupational Safety and Health (OSH) Banner of the Quarter" which was fashioned after a similar program at Mare Island Naval Shipyard.

Under this program, one production shop wins the banner, based on the shop's all-around efforts toward mishap prevention. To further motivate the employees, the banner is awarded to the winning shop by the commanding officer during a safety meeting. Photographs and information are also published in the Center's internal newspaper.

Though the commanding officer liked this program and mishaps were reduced, he felt there should be a more tangible benefit given to employees for good safety performance. The PWC safety manager, deputy production officer, employee relations manager, a management analyst, and the assistant to the business manager researched legal ways in which gifts for safety performance could be distributed.

After exploring several avenues, a program which would award dollars to every employee in the winning shops using a special achievement system already in place was implemented. It's called Safety and Health Improved Performance (SHIP) Award Program.

Each quarter there will be three shops or work centers which will win because of improved safety performance in accident prevention efforts. Eligible shops and work centers must have a minimum of six employees located in the maintenance, utilities, transportation, and material departments.

The work center must have been in existence for at least 90 days, and each employee receiving the award had to have been assigned to the shop for at least half of that quarter.

The "best shop" (first place) will be given a banner to fly for 90 days and each employee will be awarded $100. In the "most improved shop" (second place), each eligible employee receives $75. Eligible employees in the "second most improved shop" (third place) will each receive $50.

Reduction in value of all injuries must equal the cost of the program, based on the average cost of all injuries in the previous quarter; in other words, no reduction, no monetary awards. However, the banner will be awarded to the best shop even if there is no cost reduction.

One lost-time work injury in the shop or work center automatically disqualifies the shop. For first place consideration this is the only automatic disqualifier on our score sheet.

SHIP went into effect Oct. 1, 1987, and is designed to create vigorous interest in mishap prevention. The interest is high among employees, and the indication that SHIP is going to be a success is evident in that all injuries during the first quarter were reduced by 32 percent. Lost-time injuries were down 42 percent from the previous quarter.

Management at PWC San Diego is hopeful this trend will continue; if so, SHIP is a concept that could take the Navy by storm. It could be that tangible awards creating employee safety motivation could be just what is needed to turn the PWC's injury rate around.

Motivation is an old principle, and the idea of motivating employees to work safely isn't new either. The key is to identify the employees' needs and then implement programs to satisfy those needs. It's simply the old "horse and carrot" trick.

Obviously, the money in this case is the motivating factor, more so than the OSH Banner of the Quarter, which might satifsy a sociological need but doesn't motivate employees enough to notice sharp injury reductions within a one-quarter period.

There is also evidence of peer pressure and employees pressuring their supervisor to perform all safety duties as directed. The program shows employees can be motivated to work safely when appropriate rewards are presented. □

EO1 Yvonne G. Thomas

Naval Construction Training Center
Port Hueneme, Calif.
Specialty: Equipment Operator Training

EO1 Yvonne G. Thomas arrived at the Naval Construc-tion Training Center, (NAVCONSTRACEN), Port Hueneme, Calif., in March 1987 from the Public Works Department at the Naval Air Station, Adak, Alaska.

Petty Officer Thomas teaches all phases of the Equipment Operator "A" School—from trucks to bulldozers, and she takes great pride in sending the Naval Construction Force the best graduates possible. Her leadership, expertise, and enthusiasm are her greatest assets—she always finds a way to instill some in each equipment operator (EO) striker in addition to providing quality technical and military training.

Her performance at NAVCONSTRACEN was recognized with her selection as NAVCONSTRACEN's "Sailor of the Year" award and nomination for the Chief of Naval Technical Training's Sailor of the Year. She's also been selected as an alternate for the Enlisted Education Advancement Program.

Petty Officer Thomas enlisted in the Navy in September 1978 in Alameda, Calif., attended EO "A" School at NAVCONSTRACEN Gulfport, Miss., and has been exercising and honing her skills in Naval Station Rota, Spain, Naval Air Stations Whidbey Island and Adak. She attended Instructor Training School in San Diego and Blasting and Quarry School at NAVCONSTRACEN Port Hueneme.

She's been an active member of the command—serving on the NAVCONSTRACEN color guard, keyperson for the Combined Federal Campaign, and a special helper during the Christmas "Toys for Tots" drive.

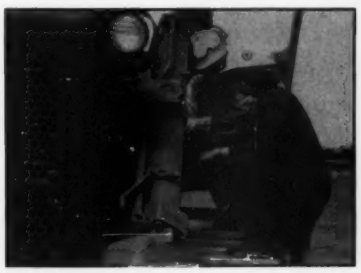
She's a rising star in the Seabees with great promise for further advancement and leadership success in the Navy.

Married to EO2 Greg Thomas of Naval Mobile Construction Battalion FIVE, they have a daughter, Corey Megan, and reside in Oxnard, Calif.

NAVCONSTRACEN provides courses of instruction in basic and advanced training for the seven Seabee (Occupational Field 13) rates, along with disaster preparedness training and the Underwater Construction School (joint Army/Navy school) for active and reserve Navy personnel, Army and Air Force members, foreign military students, and civilians. There are seven basic (A) courses, 27 advanced (C-1) courses, special construction battalion training (SCBT) courses, the disaster preparedness specialized instruction, and basic and advanced underwater construction technician (UCT) courses.

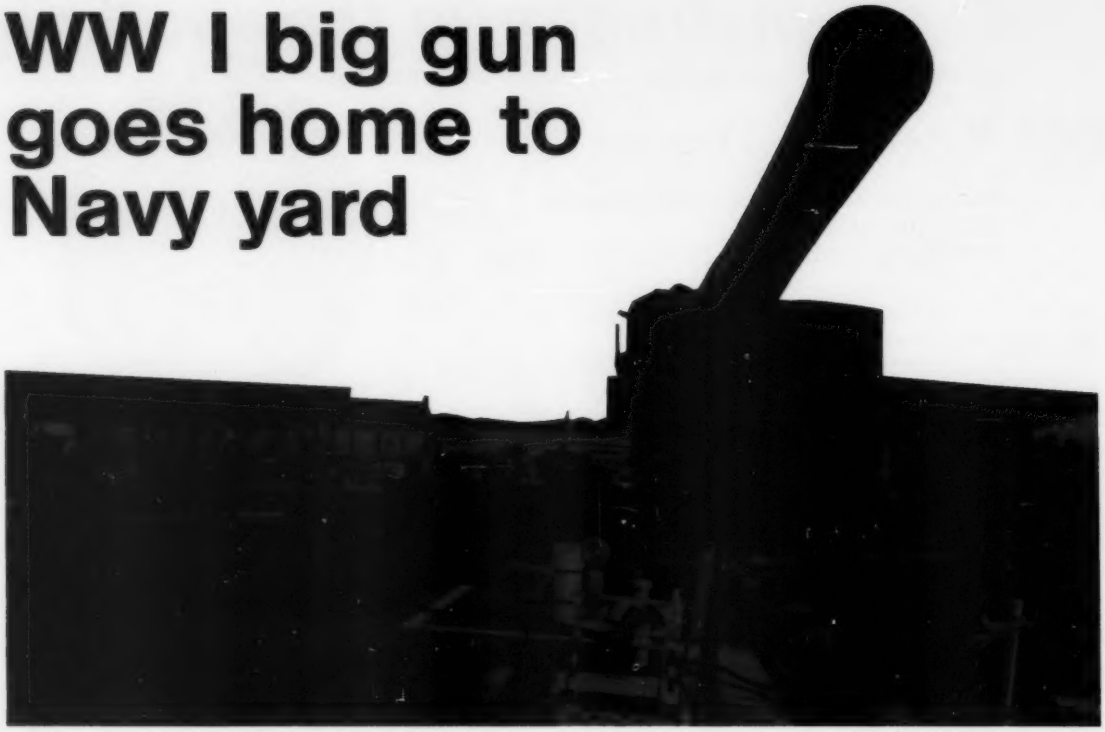
NAVCONSTRACEN is designed to administer the courses and programs assigned by the Chief of Naval Technical Training, ensuring that personnel are trained for early usefulness in their designated specialties and provide formal and refresher training in order to supplement on-the-job training.

By CUCM J. V. SISSON



EO1 Thomas solves a problem in the field.

WW I big gun goes home to Navy yard



By CHARLES R. SENERIUS
Traffic Manager
Material Management Division
Naval Facilities Engineering Command Headquarters
Alexandria, Va.

On Dec. 10, 1987, Naval Surface Weapons Center (NSWE), in conjunction with Williams Crane and Rigging, dismantled, loaded, and prepared the World War I Navy railway gun for water movement onboard Kanak Marine Towing, Ltd., barge "Jimmy Steen," towed by Kanak tug "American Veteran" to the Naval District Washington, Washington Navy Yard, for public display by the Navy Museum in Willard Park.

World War I Navy railroad gun.

The gun weighed about 535,000 pounds and was broken down into seven sections for shipping and handling purposes. It arrived at its home, the Washington Navy Yard, on Dec. 11, 1987, after sitting at NSWC Dahlgren since 1922. The gun could not move by rail transportation from Dahlgren, since rail service had been terminated a number of years ago.

This left only two modes of transport left to make the gun move, either by water or specialized heavy hauler transportation. The gun was moved by water transportation, at the lowest cost to the government.

TECHNIQUES TO MOVE THE BIG GUN

Williams Crane and Rigging crew commenced offloading preparation and quay wall platform construction for movement of the gun and components from the barge to the gun site on Dec. 12, 1987.

Similar to moving a house, this major operational undertaking required enormous amounts of timber, railroad ties, and steel 14-foot I-beams (320 pounds per foot) to build and construct a large platform on the quay wall, parallel to the barge, capable of sustaining the massive weight of the gun during the transfer from the barge onto the quay wall platform.

As the gun transfer movement commenced, the tug crew had to constantly ballast the barge in order to maintain the

barge level with that of the quay wall transfer platform.

Four 100-ton piston-lifting jacks and two 300-ton gripper jacks, mounted on steel I-beams were used, having the capability of lifting and/or pushing the gun forward over the platform rails at two-foot strokes per movement. As the gun moved slowly forward to the gun site approximately 120 feet away, the platform materials and equipment moved forward

Moving the big gun from the barge to gun site was not an easy task.

in front of the gun each step of the way by construction and rigging crew personnel.

The movement of the massive gun from the barge to the gun site was labor intensive; installation and placement of the gun on the railway platform in Willard Park was not completed until the afternoon of Dec. 13, two days later.

The platform was built by Construction Battalion Unit (CBU) 422, located at Naval Station Anacostia. CBU and public works office personnel involved in the railway construction platform project are to be commended for their outstanding achievement and success in making their significant contribution to the Naval District Washington, Washington Navy Yard, Navy Museum big gun history . . . The big gun is finally home. □

The big gun is dismantled in preparation for transportation to the Navy yard.

The big gun is towed up the Potomac River en route to its new home.

Big gun history

The Navy railway gun (Serial 148) was built by Baldwin locomotive works, near Philadelphia, under Navy contract for the United States Army. It was (by serial number) the eighth of 11 mounts designed at the Naval Gun Factory, Washington Navy Yard, Washington, D.C., for naval use in France.

The first of the three gun cars ordered by the United States Army in May 1918 was delivered early in July, followed by the second a few days later. The third was completed and placed on the docks ready for overseas shipment by the Army Ordnance Department on July 18, 1918.

The remaining gun car units were completed an ready for shipment overseas by September 20. Serial 148 was returned from overseas to Army control in 1919, to be used for sea coast defenses. Navy gun car mounting 14-inch, 50-caliber, was one of the U.S. naval railway batteries designed, constructed, and shipped overseas by the Bureau of Ordnance, Navy Department. It was eventually placed in operation in France and manned by naval personnel under the command of Rear Admiral C. P. Plunkett, USN.

The gun had the capability of firing 1,400-pound Navy shells up to a range of 23 miles. The chronology of events surrounding the first five gun cars is as follows.

	1917
Designs started	Dec. 26
	1918
Designs completed	Jan. 26
Contract let	Feb. 13
First mount completed	April 25
First mount proved	April 30
Fifth mount completed	May 25
Overseas shipment commenced	June 20
Arrival first shipment at St. Nazaire	July 27
Assembly first mount begun	July 27
Assembly of first train completed	Aug. 11
First train left St. Nazaire for front	Aug. 17
First shot fired at front	Sept. 6
Final erection and assembly of all units completed	Sept. 14

In response to a Bureau of Ordnance request, the Army subsequently returned Serial 148 to the Navy in 1922, where it stayed at the Naval Surface Weapons Center, Dahlgren, Va., until its move to the Washington Navy Yard in December 1987.

Does the Navy have TENNIS ELBOW?

By MARK E. HOLLAN
P.E., Calif.
Head, Shore Facilities Department
Naval Civil Engineering Laboratory
Port Hueneme, Calif.

In the Spring 1986 issue of the *Navy Civil Engineer,* RAdm. F.G. Kelley, CEC, USN, made the point in "Speaking from Topside" that the Naval Facilities Engineering Command (NAVFAC) has been elevated to an Echelon II command. As such, it competes directly in the OPNAV arena for resources—resources which have been made more difficult to obtain by the Gramm-Rudman-Hollings Balanced Budget Act. Overcoming the impact of this budget act is the newest challenge on the horizon, one which must be met.

If one reflects on the professional writings presented in the past five years of the Proceedings of the Naval Institute, one may conclude that many Navy strategists believe that the fleet is capable of operating independently from the shore establishment. This is, of course, the significant advantage offered by the Navy's projected 15 Carrier Battle Groups (BGs) and four Battleship Surface Action Groups (SAGs). Such Navy forces are configured to project credible sea power worldwide, perhaps to the Indian Ocean as shown in Figure 1.

This operational independence is real, providing that adequate Underway Replenishment Groups (URGs) are available to resupply the engaged BGs and SAGs. However, to conclude that the fleet is totally independent of shore facilities is to overlook the logistical impact of the forward deployment of Navy forces in the maritime strategy.

To enable the BGs and SAGs to maintain a worldwide readiness posture, a system of CONUS and forward-based shore facilities is essential. This system adds a land-based dimension to fleet sustainability, as the URGs shuttle between the forward bases and the fleet customers in the theater of operations.

Strategic lift assets resupply the forward bases from CONUS bases or from the forward staging bases shown in Figure 1. These bases are as near as Guantanamo Bay, Cuba, and as far as Diego Garcia; they are as small as White Beach, Okinawa, and as large as Subic Bay, R.P.

In the Shore Facilities Condition Assessment presented to the Chief of Naval Operations Executive Board in March 1986, the Navy's worldwide Shore Establishment was described as being in a rapidly declining material condition. The plant value was estimated to be about $83 billion. This included buildings, piers, runways, utility systems, antenna, drydocks, school-

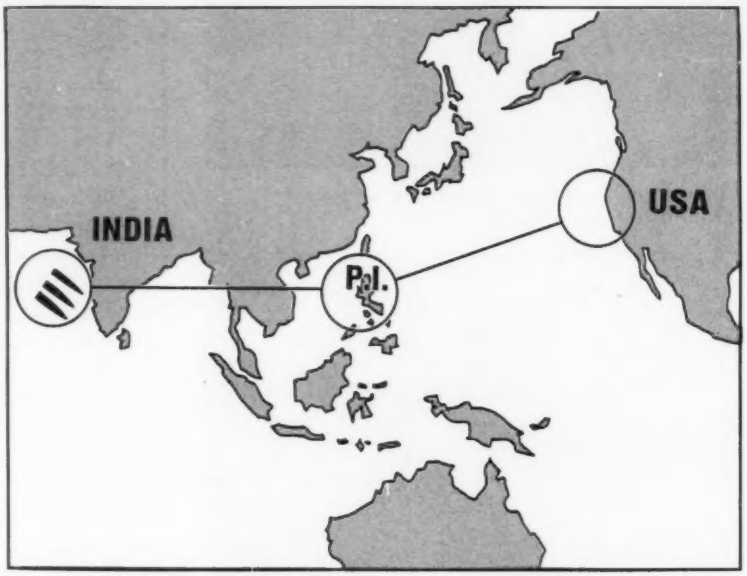


Figure 1. A resupply route from CONUS through a forward staffing base to deployed naval forces in the Indian Ocean.

rooms, magazines, and all of the infra-structure facilities that support 296 major Navy installations worldwide. The age distribution of these facilities is shown in Figure 2.

Many of them were constructed during World War II under contingency construction provisions with life expectancies of 15 to 25 years and are well beyond their design life today. In fact, using applicable commercial standards for various types of facilities, it was reported that by 1992, 37 percent of the current plant will have been in operation 25 percent beyond its theoretically useful life.

A more important measure of the state of the Navy's shore facilities is revealed in an analysis of facility readiness ratings. For the past three years, commanding officers of 140 of the largest shore stations have been reporting the mission-related readiness of their facilities to meet the demands of the fleet. This report includes 23 missions common to shore activities: port operations, aviation operations, utility operations, security and supply services, and bachelor housing.

A judgment is made by the commanding officer as to what readiness category should be reported. C1 through C4 are categories in a broad rating system which classify the mission from fully operationally ready (C1) to not mission capable (C4). It was stated during the Shore Facilities Condition Assessment that there was a definite trend toward declining mission ratings. In fiscal year (FY) 1985 over 45 percent were rated as C3 or C4; that is, marginal to incapable of providing mission support.

In that same Condition Assessment, another facility condition indicator cited was the Backlog of Maintenance and Repair (BMAR). The total Operations and Maintenance, Navy (O&MN) BMAR was reported as about $2 billion in FY 85, with half of that classified as critical.

The criteria for designating a deficiency as critical are: it contributes to a C3 or C4 readiness rating; it poses a serious health or safety hazard; it would cause a catastrophic environmental failure; or it will have an adverse impact on the quality of life. With $1 billion of critical BMAR, the Navy's facilities

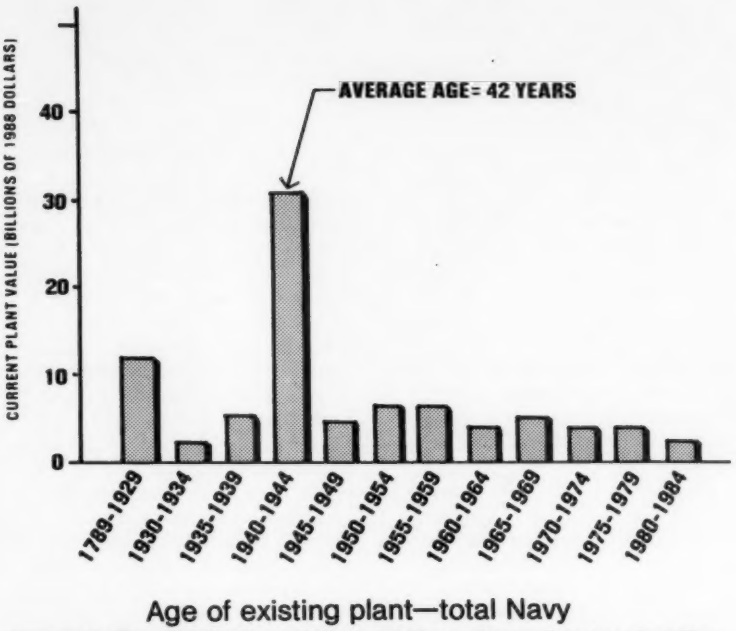


Figure 2. The distribution of the total Navy plant value as a function of the year it was built.

have serious problems.

Senior military and civilian managers have made decisions which, while well-meaning and valid, have jeopardized the serviceability of essential forward bases and perhaps the sustainability of the fleet. It is understandable that decision makers have had a tendency to concentrate on the major instruments of military power—ships, aircraft, missiles, etc.

Unfortunately, the means to keep these weapons supplied, maintained, and combat effective have had a tendency to become a secondary consideration, perhaps falling into the "nice to have but not affordable" category. This has led to the construction of facilities which were designed to meet cost and ease of maintenance criteria. They were not designed to military standards of survivability and repairability consistent with the projected threat.

I hesitate to suggest that the Naval Shore Establishment has been the victim of a short-sighted management strategy. However, the Shore Establishment may be characterized as old and soft (not hardened to meet the expected threat), with perhaps 45 percent of the facilities ranging from "marginally capable" to "not capable" of providing required mission support. We find ourselves with this distressing state of facilities readiness before the first Soviet bomb falls or the first Naval Spetsnaz swims ashore.

We can discuss for hours, if not our entire careers, the "armchair" order of battle and correlation of forces in combined arms warfare with Soviet Union. We may even touch on whether facilities rather than battle groups will be targeted by enemy action. In fact, such debates are moot.

I can only suggest a reading of the Congressional Committee Report on the Pearl Harbor disaster in 1941: "Commanders in the field cannot presume to expect that they will be advised of the exact time and place an enemy will attack or indeed that their particular post will be attacked. As outpost commanders it was their responsibility to be prepared against surprise and the worst possible contingency."

Imagine that you are on the staff of the public works department of a small, forward U.S. Navy base located within the Soviet Pacific Ocean Theater of Military Operations (Teatr Voennykh Deistvii, abbreviated TVD) or Pacific Ocean TVD. Furthermore, suppose that the attackers wouldn't "waste" a conventional air or surface strike against

your base. Is your base safe and secure? Perhaps not; as reported in the 4th edition (April 1985) of Soviet Military Power, a brigade-size unit of Naval Spetsnaz forces is assigned to each of the four Soviet fleets.

Naval Spetsnaz forces assigned to the Soviet Pacific Fleet, by way of example, would be inserted as small 5- to 12-man teams. The teams would be transported to target areas, perhaps yours, by aircraft, submarine, or surface ship and would be inserted immediately prior to hostilities. Once deployed these specially trained teams would conduct reconnaissance and tactical operations against a wide variety of Navy targets.

These targets include ships and submarine bases, airfields, command and intelligence centers, communication facilities, ports, harbors, radar sites, and nuclear weapons facilities. While a Naval Spetsnaz team is small, it is reportedly able to "achieve results disproportionate to its size against such a critical, yet often vulnerable, target list."

It seems prudent to assume that our forward bases and the military functions contained on them are vital to our ability to project naval power. Certainly, the Japanese Navy acted accordingly in 1941, and the Soviet Navy is reputed to be at least as well-equipped to neutralize our facilities immediately prior to hostilities.

Using the visual analogy depicted in Figure 3, Uncle Sam stretches his right arm out across the oceans to project naval power, while with the left he embraces the industrial base of our country. In this sketch, the handful of war-fighting materials represents the Carrier Battle Groups and the Surface Action Groups. Such materials are clearly the concerns of the system commands—the Naval Sea and Naval Air Systems Commands, in particular.

Where is NAVFAC in this analogy? I submit that it is represented by the three joints of the right arm. The shoulder is analogous to CONUS embarkation points, such as San Diego or Norfolk; the elbow is analogous to forward bases, such as Subic Bay and Rota; and the wrist is analogous to far-forward bases, such as Diego Garcia or an amphibious beachhead. Just as well-working joints are necessary to deliver meaningful blows with the hand, so too are well-working shore bases necessary to effectively deliver meaningful blows with forward deployed Navy forces.

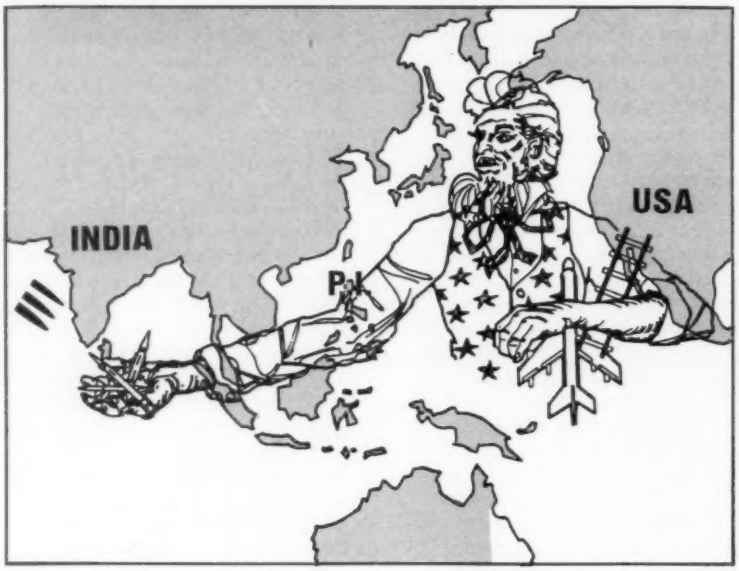


Figure 3. Uncle Sam projects naval power into the Indian Ocean with his right arm while embracing the industrial base of our nation with his left arm.

I am not suggesting that shore bases are more important than Carrier Battle Groups or Surface Action Groups. However, I am suggesting that the combat effectiveness of those groups will be greater if the Navy doesn't have "tennis elbow"! I believe that NAVFAC can increase combat effectiveness through an interaction between the shore facilities and the mission-critical functions they support.

Certainly those in the NAVFAC family support the Naval Shore Establishment during their careers as Civil Engineer Corps officers, Seabees, or civilian engineers. They plan and manage the "birth" of new facilities, developing designs, specifications, and criteria for the Naval Shore Establishment.

Others develop and implement the diagnostic procedures and tools needed to function as smart managers, whether accepting new construction or choosing between repair or replacement of overage facilities.

These same engineers witness the "death" of facilities through deterioration, natural disaster, regulation, obsolescence, economics, and encroachment. However, if we accept the premise that the Naval Shore Establishment is critical to forward deployed Navy forces, then it is logical to assume that they also will witness the loss of some facilities to terrorist attacks during peacetime and to Spetsnaz-type forces and weapons effects during wartime.

If the wartime loss of a facility puts in jeopardy a mission-critical function, that damaged facility may have to undergo "resurrection." It follows then that one of the missions of the Naval Construction Forces (NCF) is to repair facilities damaged during combat.

However, there is a broader base of responsibility in the "resurrection" of facilities than just the NCF. Those involved in the "birth" of facilities should consider the untimely "death" of the facilities through military action, and ensure that they have enhanced the prospects for "resurrection" by considering war damage repairability early in the design and specification of that facility. It may not be affordable to

Continued on page 21

Team leader Lt. Priscilla A. Futcher, CEC, USN, and a crew of eleven Seabee instructors from NCTC, Gulfport, Miss., are destined for the country of Madagascar in early July 1988. Their mission is to teach the Malagasies construction and road-building techniques in support of the country's new Disaster Recovery Program.

The military training team (MTT) will arrive in time to meet $1M worth of heavy construction equipment and rolling stock pulled from CBCs Gulfport and Davisville. Under the overall direction of the Office of Military Readiness, NAVFACENGCOM, the grant aid package is the result of a highly successful Seabee training effort completed in November 1987 for the Malagasy military.

The two-day OPNAV Land Use Compatibility (LUC) seminar is a popular element in the Navywide LUC program for encroachment control planning. It's designed primarily for commanding officers, public works officers, and senior planning staffs. A LUC seminar aimed especially at activities in the Southeast region was presented at the Charleston Naval Station in June, and a West Coast presentation is planned for the fall. For further information, phone Dr. John Murphy at OP-04E, Autovon 221-7353.

Under the authority of Public Law 99-167 as amended by Public Law 100-202 the Navy and GSA recently combined their efforts to auction an unused portion of land on NAS Miramar. The land sold (150 acres) generated $23 million. The proceeds from this sale will be used to purchase land in San Diego for family housing or to construct family housing. The second auction (33 acres) was held in June 1988. The proceeds from this auction also went for purchase of family housing sites.

CNO has issued a new Air Installations Compatible Use Zones (AICUZ) program instruction 11010.36A dated April 11, 1988. This instruction culminates an effort which began over one year ago to enhance the AICUZ program. The new instruction contains significant improvements by providing planners with more detailed land use compatibility guidelines, providing the Navy and Marine Corps with a vehicle to address projects or future operations, strengthening environmental documentation guidelines and responsibilities, and providing additional guidance in the areas of accident potential zones and real property management.

NAVFACINST 11010.44E, the *Shore Facilities Planning Manual,* has been printed and distributed by the Defense Printing Office. It contains significant changes to the procedures for preparing and submitting documentation for military construction and nonappropriated funded projects. The .44E replaces several old instructions, including NAVFACINST 11010.57C (site approval) and 11010.32F (final military construction documentation).

Highlights of changes in the instruction include: An expanded four-part site approval form, NAVFAC Form 11010/31. (This is being printed and distributed by Defense Printing Office.) The form doesn't require any more information than the old one, but it does specify required information that was often omitted, causing delays in getting approvals. A new Project Data Sheet (PDS) replaces the preliminary DD Form 1391, and is used for the initial submission of projects.

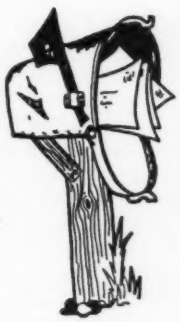
For final military construction planning documentation, the forms haven't changed, but some of the information, preparation, and review procedures have. The facility study has been expanded to include important information required for the certified, ready for design (CRD) process and information that used to be in the "mandatory statements" on the DD Form 1391. The DD Form 1390 will be prepared by NAVFACENGCOM rather than the activity.

If your activity has not received a copy, please contact Ms. Yvette Franklin, NAVFACENGCOM, Code 200AYF, Autovon 221-7364.

Three high-potential employees were selected for the NAVFAC Procurement Scholarship Program at the Naval Postgraduate School in Monterey, Calif.: Rita Brede, of the Naval Energy and Environmental Support Activity; Elaine Leder, of the NAVFAC Western Division; and Joyce Runyan, of the NAVFAC Procurement Management Review team. The 13-week program will provide intensive, individualized instruction to increase competence in acquisition and contract skills and one of several ongoing programs designed to enhance the professionalism of the NAVFAC procurement cadre, and provide the expertise to make timely and sound procurement decisions.

We'd like to hear from you . . .

If you have comments, questions, suggestions, or even complaints or gripes, we'd really like to hear from you, the readers. Write a letter to the editor . . . then we can give you the things you'd like to see in the magazine. Write to: Editor, Navy Civil Engineer, CECOS Code 20M, CBC Port Hueneme, Calif. 93043-5002.



Navy, Army NASA specs now on CD-ROM

The full text of all Navy, Army, NASA, and VA construction guide specifications is now available on one compact disk, read-only memory (CD-ROM), the Construction Criteria Base (CCB). Using CCB, any word, phrase, or topic can be located within five seconds. This information can then be used with SPECSINTACT, a program included in CCB which allows the user to "build" a specification tailored to exact project requirements.

The Construction Criteria Base (CCB) is a fully indexed, mass-produced data base, the computerized equivalent of an entire engineering library loaded on a single 4.7-inch compact disk. The CCB is the result of two years of research sponsored by NAVFAC and the Army Corps of Engineers (COE) in conjunction with the National Institute of Building Sciences (NIBS). Its purpose is to improve dissemination of guide specifications and other documents related to design and construction, and to eliminate the inefficiencies of the current construction criteria system.

A severe problem in construction is the mass of specifications and standards which must be used. Federal construction criteria include more than 150,000 pages of data which are not available from any central source; NAVFAC alone has over 400 guide specifications and design manuals.

Why your organization should participate

NAVFAC has worldwide responsibility for $92 billion in existing facilities, $5 billion per year in new construction and maintenance, and over 3,000 architectural/engineering firms under contract. Difficulties with coordination, updating, dissemination, and effective application of specification information for construction projects on this scale can be overwhelming. There is too much paper for the information "hidden" within the documents to be effectively used and visual search for applicable sections of a document is time consuming and subject to error.

To solve these problems, NAVFAC, COE, NASA, and NIBS began a joint effort to organize all construction criteria onto one CD.

A 4.7-inch CD holds a massive amount of information—the equivalent of 250,000 pages of paper copy or 1,650 360K floppy diskettes. Unlike floppy disks, CDs are not susceptible to read errors due to dust or scratches, and are not damaged by normal temperature variations.

Unlike magnetic media and paper copies, CDs are not subject to change or erasure by users. Information is Read-Only Memory (ROM) recorded by laser, so it cannot be altered in any way by your computer equipment, nor can pages be lost as they can from paper copies.

On the other hand, information on the CD is easily transferred to diskette, tape, or other media.

What CCB does

Two programs contained within CCB are FastFind and SPECSINTACT. FastFind is a powerful search and retrieval package. SPECSINTACT is a construction specification building and processing system which allows access to all guide specifications in the CCB.

Suppose that you need to find specifications for concrete. Type the word "concrete," or narrow the field by adding modifiers, for example, "cast-in-place concrete." FastFind will search the selected specification documents and within five seconds will list every document name and page number containing the target word or phrase.

You can then view each of these documents. Specifications which may take hours, weeks, or months to locate with paper copies, can be found, listed, and printed in seconds or minutes.

Use CCB to move any document from any of the data bases into a new specification file or copy to floppy disk. If you copy to disk, CCB provides simultaneous word processing conversion for editing in WordStar, Samna, RFT, DEC, MultiMate, WordPerfect, ASC II, Volkswriter, CEOwrite, TXT, WordMarc, Wang IWP, or MS Word.

Once you have located and listed the appropriate specifications, use SPECSINTACT to "build" a specification tailored to the precise requirement of the specific project.

SPECSINTACT features include:

- Automatic renumbering of pages and paragraphs whenever additions or deletions are made.
- Reference checks—Verification that references are listed in the front of each section and that references listed in the front are actually cited in the document.
- Submittals—SPECSINTACT creates an overall submittal list for the entire construction project.
- Automatically generates a table of contents of the finished specification.

How to subscribe

CCB is offered on a prepaid subscription basis to all government and nongovernment users. A new disk containing the entire data base will be automatically delivered quarterly to subscribers. Current delivery dates are January, April, July, and October.

To subscribe, please write or telephone the National Institute of Building Sciences, Attn: CCB, 1015 15th Street N.W., Suite 700, Washington, DC 20005, Telephone: (202) 347-5710.

For a demonstration of the CCB system, contact Thomas R. Rutherford, NAVFAC (Code DS02), 200 Stovall Street, Alexandria, Va., 22332-2300; (202) 325-0450, Autovon 221-0450. □

Geodesic dome in Antarctica threatened by snow movement

By JERRY THOMAS
Public Affairs Office
Naval Civil Engineering Laboratory
Port Hueneme, Calif.

The two-mile-thick Antarctic polar ice cap is slowly sliding and settling, threatening the geodesic dome that provides a controlled environment for scientists and support personnel at the South Pole.

The snow beneath the 164-foot-diameter facility at Amundsen-Scott Station is creeping from two to three inches a year in some places; sinking differentially (more rapidly in one area than another) and creating a twisting stress dilemma for the National Science Foundation (NSF) which owns and operates the dome. Engineers predict the polar complex covering four permanent structures will collapse eventually.

The Naval Civil Engineering Laboratory (NCEL) Port Hueneme, Calif., is no stranger to providing polar engineering assistance to NSF and the Naval Support Force Antarctica (NSFA). Involved in such work for more than 30 years, the Laboratory has been instrumental in exposing the dome's precarious predicament and predicting its future.

Survey measurements taken over the past five years have determined the rate of settling. Latest data revealed a maximum differential settlement of five inches. Although distortions aren't yet near the evacuation level, engineers continue to watch for localized buckling of panels and deformed frame members considered as significant early warnings.

According to computer simulations and recorded field data, the dome conceivably could be abandoned within 10 to 12 years and replaced by another all-weather station.

Joseph Barthelemy, one of NCEL's polar project engineers and veteran of 12 trips to the Arctic and Antarctic, said the dome has already exceeded its 10-year design life. A study to determine how long the dome

Although snowfall at the South Pole measures less than an inch a year, snowdrifts swept by winds gusting up to 50 mph cause major operational and logistics problems. This year, the snow covers half the 164-foot-diameter geodesic dome which is approximately 50 feet high.

A tracked vehicle drives through the dome's main entrance. The facility's structural integrity is threatened by the slow movement of the polar ice cap.

can withstand ice field motion was made by NCEL with the aid of non-linear finite element computer analysis. A description of the base ring differential displacement was obtained by a "least squares" analysis of the surveyed foundation displacement data. Results indicate that the South Pole dome can withstand twice the settlement currently induced by existing foundation movement.

Approximately 100 scientists and engineers are deployed to the South Pole during the active summer season (November-December-January). The 15 to 20 personnel who "winter over" are marooned for eight months as they perform limited scientific work and operational maintenance. The average yearly temperature at the South Pole is 57° (F.) below zero. The coldest recorded temperature is 113° below zero.

NCEL project engineers Grant Davison and Bradley Posadas of the Expeditionary Facilities Division are the most recent NCEL representatives to visit the Antarctic. They spent six weeks this year testing densities of the snow road from McMurdo Station to an airfield four miles away. They also collected data to update NCEL's engineering manual prepared exclusively for McMurdo. The manual documents engineering methods and operational procedures dealing with the local environment. Originally published in 1974 and revised in 1979, the manual is being updated chapter by chapter.

McMurdo has grown from a base camp into a sprawling logistics center

NCEL was a charter member of the crew aboard a Coast Guard ice breaker that searched the Antarctic in 1955 for sites to establish a base as part of the International Geophysical Year, a multi-national scientific effort still active and productive. The chosen site was developed into McMurdo Station. During frequent trips, NCEL engineers and technicians have witnessed McMurdo evolution from a base camp for scientific studies into a sprawling logistic center supplying many inland stations and outlying field camps.

NCEL designed hardware and procedures for construction of a large ice wharf following a severe storm in 1972 that destroyed sections of a steel facing abutting Winter Quarters Bay. Ships were unable to dock and unload cargo and fuel until a new facility was built. During the winter, special pump sets developed by NCEL repeatedly flooded a large area of near-shore ice with seawater until a 20-foot thickness was built up.

The ice wharf remains the preferred site for offloading ships at McMurdo Station as it withstands the wear of docking operations and the tear of ice movement. For example, visual and photographic observations this year revealed little or no damage to the ice wharf after three ships had docked. In documenting operations, NSFA filmed a movie and took photographs and NCEL took photos during the docking of a Coast Guard ice breaker. A large cargo ship also docked twice without causing significant wharf damage. □

Membership drive underway for Association of Navy CEC officers

The Personal Data Book which is published by the Association of the Navy Civil Engineer Corps Officers (ANCECO) will be reissued in October 1988. If you wish to be listed in the Personal Data Book, please complete the following data form (or a copy of it) and mail it to the following address: Lt. Frank Cantwell, CEC, USN, Secretary-Treasurer, ANCECO, c/o NAVFACENGCOM (Code 09M1A), 200 Stovall Street, Alexandria, Va. 22332.

The deadline is Oct. 1, 1988. At the same time you may renew membership in ANCECO and order a copy of the book by enclosing a check for $6 payable to ANCECO. Officers not interested in an ANCECO membership are also requested to forward a completed form to help make this edition of the Data Book complete.

Personal Data Book Application

1. Print neatly.
2. Use standard rank abbreviations--ENS, LTJG, LT, LCDR, CDR, CAPT, COMO, RADM, VADM, ADM.
3. Do not use USN or USNR except for reserve retirees. Include this information in the "rank" block.
4. Use standard registration abbreviations; e.g., PE, EIT, RLS, RA, AIT, etc.
5. Use normal society abbreviations; e.g., ASCE, ASME, USNI, etc.
6. One letter per square--one square equals one space.

NAME (Last)

(First, Middle Initial)

STATUS A=Active R=Retired X=Reserve

RANK

NICKNAME

STREET ADDRESS

CITY

STATE

ZIP CODE

COLLEGES ATTENDED

DEGREES

LICENSES

STATE

STATE

STATE

SOCIETIES

IMMEDIATE FAMILY

RELATION*

NAME (First and Middle Only)

YEAR BORN**

*W--Wife; H--Husband; S--Son; D--Daughter.
**For children only.

news worth reviewing

First female maintenance superintendent

Toni Hooper is the first female head of a public works center (PWC) maintenance department, and what makes it even more significant, is that it is the biggest of the nine PWCs at that. As a GM-14, she holds the highest position among federally employed women in Subic Bay and within U.S. facilities in the Philippines, reports Public Information Officer G. G. Sardenia, and the only maintenance superintendent in the Naval Facilities Engineering Command (NAVFAC).

Hooper's story is a classic example that hard work and determination pays off. She started in 1960 as a clerk-typist with the Army at White Sands Missile Range, New Mexico. After going through almost every grade level, she was selected as administrative officer for the maintenance department of PWC San Francisco in 1978.

Next, in 1982, she became a management analyst with NAVFAC San Diego, and two years later, she was promoted to supervisory management analyst. Her stint with NAVFAC San Diego opened doors to unique opportunities and she was into commercial activity studies that took her to all PWCs in CONUS.

At PWC Pensacola Hooper served as acting maintenance department head for nine months, the first woman to do so. She went to PWC Yokosuka for a three-month duty as acting management analysis officer.

Toni Hooper

In 1985, Hooper, a selectee for the highly competitive Production Group Management Development Program (PGMDP), began extensive two-year training as a department head. In 1986, she was selected director of the recurring work division. Eight months after she received her PGMDP diploma, her promotion as Code 500 was announced.

"Getting the job is the highlight of my career," Hooper said. "I took over a highly motivated, dynamic group," she added. "The people are dedicated, the pace is fast, and managing it all is very challenging."

PWC Subic Bay's maintenance department has a workforce of more than 1,500 employees who carry out minor construction and regular maintenance and repair of buildings, roads, bridges, piers and other structures.

Seabee Museum opens at Gulfport

A branch of the Civil Engineer Corps/Seabee Museum opened its doors this spring at the Seabee Center in Gulfport, Miss. Hark Ketels, director of the Port Hueneme Museum, helped set up the branch, and participated in the ribbon-cutting ceremony. "Although the museum has a lot of room to grow," stated Ketels, "it does fulfill an important community function in community relations."

Guest speaker for the opening, was Chief of Civil Engineers, RAdm. B. F. Montoya, who stated, "This Seabee Museum can be a link between the Seabees and the community. It gives us a chance to open our gates to those outside and share some of our Seabee history with them."

On display are the original paintings of the Fighting Seabee created by F. J. Iafrate; Adm. Ben Moreell, commonly referred to as the father of the Seabees; and Construction Mechanic Third Class Petty Officer Marvin Shields, the only Seabee to receive the Congressional Medal of Honor.

For information, call the public affairs office at (601) 865-2393 or Autovon 363-2393.

MIUWU commissioned into fleet

Mobile Inshore Undersea Warfare Unit (MIUWU) 212, a special reserve force unit, officially became a part of the Navy's Atlantic Fleet during commissioning ceremonies held at the Seabee Center, Gulfport, Miss., recently, reports J02 Gary Palermo.

The Gulfport-based unit is a rapidly deployable force capable of providing vital surface and subsurface surveillance, tactical communications, and coordination during fleet operations. There are 24 units nationwide, an increase from just 18 a year ago. According to a Navy report, plans are in progress to increase the number to 28 by 1990.

Unlike most naval reserve units which augment active-duty commands in times of need, MIUWU-212 is completely self-sustaining in accomplishing its mission.

Capt. C. W. Orr orders MIUWU-212 to "set the watch" as he assumes command of the new unit.

The unit operates from land rather than by sea which not only saves millions of dollars but allows naval vessels to be utilized in other ways.

The men and women who make up the unit are hand-picked and for the

most part are individuals with prior active service.

"We don't want trainable assets," said Captain John Natter, Commander, Inshore Undersea Warfare Group Two, at the ceremony. "We want already trained assets. 'Big Daddy' can't take care of us. There is no Big Daddy."

According to RAdm. Jack S. Smith, Commander, Naval Reserve Readiness Command, Region 10, who also participated in the ceremony, the increasing number of MIUWUs and their independent operation testify to the increasingly more active role of the ready reserve force in the fleet.

"Today, the term 'naval reserves,' is a misnomer," said RAdm. Smith. "Today they are a more active asset to the fleet. They're being called more often—and not always for exercises. Many times it's the real thing. This is a no-nonsense job of preparing men and women to go to war. We want to keep that edge to make us the very best that's ever been."

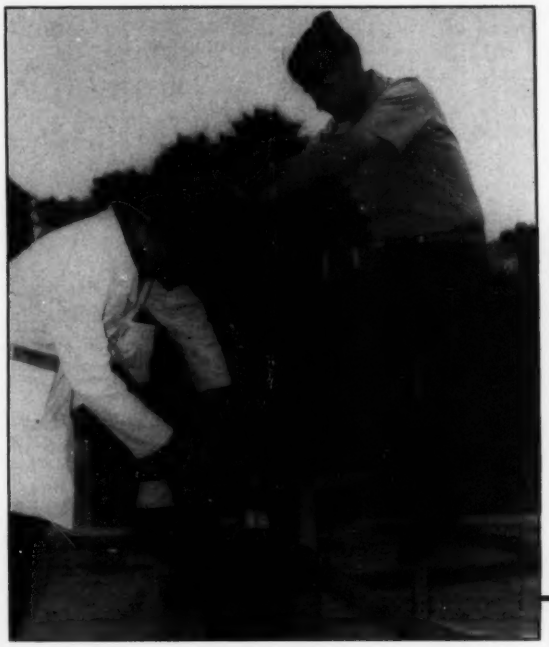
When fully manned, MIUWU-212, commanded by Captain C. W. Orr, will be comprised of 70 reservists from among 31 Seabee and fleet occupations.

What looks like a bike . . . isn't!

The contraption looks like a stationary exercise bike. It even has the familiar frame, handlebar seat, and pedals. But it will never be found in the gym, garage, or bedroom.

Instead, the U.S. Marine Corps is determined to harness the kinetic energy exerted by bikers toward a drastically different direction. The goal? To invent a portable leg-driven, bike-like apparatus that can pump fuel into vehicles, often at remote advance locations.

The Naval Civil Engineering Laboratory (NCEL), Port Hueneme, Calif., is designing and developing what the Marines call the "bike pump."



NCEL is building a prototype bike pump for the Marine Corps to pump fuel into vehicles at remote areas. Major David John, liaison officer at the Lab, pedals while project engineer Ken Michon makes adjustments to the unique vehicle.

They have a need for such an innovative device to augment diesel and electric pumps in expedient refueling systems.

For example, during emergencies when external power is unavailable, a Marine, comfortably perched on an adjustable seat, pedals vigorously and pumps 35 to 50 gallons of fuel a minute. The maximum fuel load per vehicle is 250 gallons. The bike pump also can be used as an auxiliary refueling station when needed.

Tentative plans call for field testing next spring of a rugged hand-carried prototype that can be assembled and ready for pumping within five minutes. Approval for service use is targeted for 1989.

Seabee "Big Guns" practice what they preach at a recent fun run in Atlanta. Caught in the action are (from left) RAdm. D.O. Smart, CEC, USNR, Commander, Reserve Naval Construction Force; RAdm. (Select) M.H. Chiogioji, CEC, USNR, Commander, Reserve Division, Naval Facilities Command; and RAdm. P.C. Rosser, CEC, USNR, Commander in Chief U.S Naval Forces, Europe, Assistant Chief of Staff, Mediterranean Region.

Durability: A measure of concrete quality

By LT STEPHEN T. ECKEL, CEC, USN
P.E., N.C.
Director, Facilities Acquisition Division
CECOS Port Hueneme, Calif.

The standard and best understood measure of concrete in-place quality is the cylinder compression test. While there is no disputing that this is a valuable determinate of concrete quality, especially of the ability of concrete to carry compressive load, is it always the most important determinate?

One answer is to think of the types of concrete failure most often experienced. While one occasionally hears of a catastrophic structural concrete failure, most failures are noncatastrophic and are due to poor concrete durability.

Some types of durability failures are salt/sulfate attack, erosion (wind and water), and chloride attacks on reinforcing steel. By durability, I mean the resistance to outside agent penetration.

The usual cause of durability failures is some kind (or combination) of agent penetration (chlorides, sulfates), coming from a marine environment, the aggregate type, groundwater, or other means. These failures will show up as spalled concrete due to reinforcing steel (resteel) corrosion, loss of concrete mass due to chemical recombinations in the concrete structure, "rusty" stains emanating from cracks in the concrete, and other similar manifestations.

Ultimately, loss of durability results in the failure of the concrete retaining wall, column, or slab. Failure means the inability to perform the task for which the concrete was designed or the shortening of its service life.

Even though a given concrete placement attains its design strength, other factors (such as its durability) may contribute to its eventual failure. An example would be a reinforced concrete seawall designed using 6,000 pounds per square inch (psi) concrete which passes all of the quality checks at placement (compressive strength at placement was 6,000 psi, the mix was placed as designed, etc.) but fails (cracks, loses strength) due to agent penetration much sooner than its design life intended.

Note that the key word in the previous paragraph is penetration. Stated another way, if the disruptive agents cannot penetrate the "skin" of the concrete, they will not be able to facilitate corrosion or create chemical recombinations within the concrete member (see the sketch for an illustration of terms, not to scale).

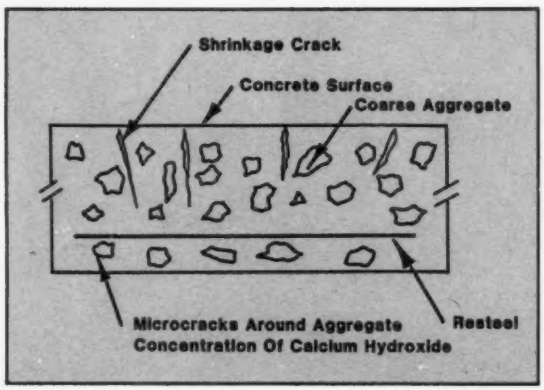
What steps can be taken to improve the concrete's durability? In the design stage, the concrete mix must be designed to not only carry the loads specified by the structural engineer, but should also resist water infiltration (i.e., the minimization of surface and microcracks which transmit fluid). As previously discussed, minimization of cracking results in more dense, durable, longer-lasting concrete. Reinforced concrete design parameters to control in order to increase durability are:

- A water/cement (W/C) ratio of 0.45 or less
- The use of pozzolans for cement replacement
- Use of an alternate cement type (Type II or V) if thermal or drying shrinkage is a potential problem
- The use of air entrainment to improve workability and cold weather resistance
- The use of aggregates which are free from chlorides and are nonalkali reactive
- Mix water should contain chlorides less than 500 parts per million (ppm) and have a sulfate content less than 1,000 ppm
- The use of water-reducing admixtures
- Concrete cover—2.5 inches of concrete over primary reinforcing steel resteel and prestressing tendons. 1.5 inches of concrete over secondary resteel such as stirrups or mesh
- Coatings (such as epoxy) placed upon resteel to minimize chloride attack.

These are to be used depending upon the concrete's design use and the environment it is to be subject to. The major reference used was the American Concrete Institute Special Publication 47.

Probably the most important durability enhancer is attention to the water/cement (W/C) ratio. A high W/C invites fluid

Continued on page 30



Newly developed technology permits soft solder fabrication of aluminum

By W. L. FALKE, L. A. NEUMEIER, and K. W. MLYNARSKI
Bureau of Mines
U.S. Department of the Interior
Washington, D.C.

Tin-lead (soft) solders for many years been the mainstay of industry for the joining of copper and its alloys. In contrast, no acceptable tin-lead soldering process has existed for the joining of aluminum and its alloys. Aluminum is very reactive and its surfaces inherently have a tin oxide film. This stable film gives aluminum its shiny luster, but it also resists the action of conventional soldering fluxes. The presence of the oxide film prevents the direct contact of the molten solder on the aluminum—contact that is required for wetting, spreading, and joint formation.

Relatively thin-section aluminum fixtures have variously been fabricated by using zinc solders and reactive fluxes, by brazing with lower-melting silver alloys, or by fluxless vacuum brazing. These procedures require precise control of temperature and other conditions. They do not lend themselves to repair of defective components. Consequently, such fixtures have commonly been scrapped.

Bureau of Mines research has, however, developed a technology to condition aluminum substrates so they will form strong and stable joints with tin-lead solders. This technology provides an important advance in the fabrication and repair of aluminum assemblies.

The technique involves electroplating a thin nickel-copper alloy coating over zincated aluminum or aluminum alloy substrates. Such coating can then be readily soft-soldered using standard tin-lead solders and fluxes. The Bureau has received a prestigious I·R 100 award for this significant technology development.

Plating and Soldering Procedure

Initial research centered on assessment of basic factors inhibiting the use of tin-lead (Sn-Pb) solders for joining of aluminum. When using highly reactive fluxes, Sn-Pb solders can be induced to wet and spread on aluminum. Such joints, however, soon corrode at the solder-substrate interface, even from air humidity.

The solder will commonly peel away from the aluminum. No useful strength is sustained. It was concluded that stable Sn-Pb solder joints could be formed on aluminum only with use of an intermediate metallic coating.

Copper was an initial choice as an intermediate coating. For these and subsequent plating experiments, the aluminum was cleaned chemically with sodium hydroxide aqueous solution or sodium carbonate plus sodium phosphate solution. Particularly dirty surfaces were first mechanically cleaned by sandblasting or wire brushing. Any oily film was removed with solvent.

After cleaning, a zinc film, conventional pretreatment for subsequent plating of aluminum and its alloys, was applied by immersion or swabbing using Zelly zincate solution. The subsequently applied copper plating, when less than roughly 10 micrometers (μm), simply dissolved in the Sn-Pb solder along with the thin zinc film, bringing the solder into direct contact again with the aluminum surface.

That is, the solder dewetted when the copper dissolved after initial wetting. Thicker copper prevented the dewetting, but the copper then tended to separate from the aluminum, resulting in poor joints.

Plating of nickel onto zincated aluminum prevented the dewetting, but the solder spreadability was retarded. Plating of copper over nickel resulted in better solderability than did copper or nickel alone. However, joint strength was inconsistent. Plating of layers of copper-nickel-copper yielded good solderability but was deemed too complex and time consuming. A way was needed to plate nickel-copper (Ni-Cu) alloys in a single step.

The literature revealed no adequate electrolytes for plating Ni-Cu alloys on aluminum. After substantial experimentation, aqueous solutions of acetates of nickel and copper were found to produce excellent coatings. A nickel-to-copper acetate ratio of roughly 10-to-1, typically at about 125 g/L nickel acetate hydrate and 10 g/L copper acetate hydrate, was found to give consistently good deposits, with H_3BO_3 added as a buffering agent.

Although bonding between the coating and substrate was generally good for a single zincate treatment, high bonding strength was more consistently obtained with double zincating. This consisted of dissolving the first zincate layer in nitric acid solution and repeating the zincate application.

The Ni-Cu alloy coatings were electroplated using electrolytic cell

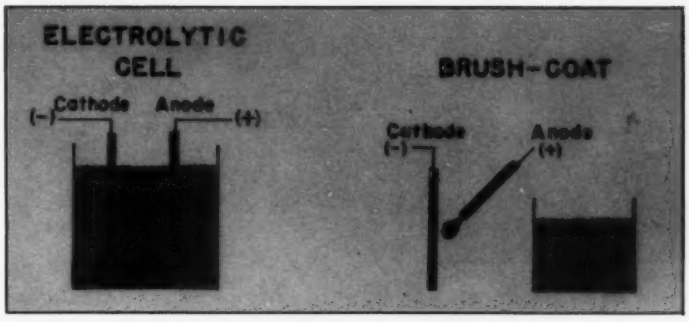


Figure 1. Simplified schematic showing essential components for nickel-copper-alloy electroplating of aluminum by immersion cell (left) or brush plating.

(immersion) or brush-coating techniques. Although a controlled-current power supply provides best control, any type of power source capable of reaching about 12 V and 2 A can be used.

For the cell bath, current density (CD) values from ~15 to 35 milliamperes per square centimeter (mA/cm^2) were found to produce good coatings. For brush plating, values of ~100 to 350 mA/cm^2 (brush-to-coating contact areas) were shown to result in good coatings. Deposition period depends on the area to be coated, the coating technique, and the thickness desired. The brush-plating technique is especially useful when coating and soldering a localized area, as is the case for repair operations.

The nickel in the deposit increases with increasing CD. The range of 30 to 70 percent Ni has been found to produce good solder joints.

The thickness of the Ni-Cu deposit is a function of the CD and deposition period. Most solder joints have been made on coatings ~1 to 3 μm (0.04 to 0.12 mil.) thick.

When zincated aluminum substrates were properly coated with Ni-Cu alloy, standard Sn-Pb solders of various compositions were found to be consistently wet and spread on the coatings when using standard acid- or rosin-type fluxes. The extent of spreadability generally was equivalent to that on copper or brass, except that spreading stopped abruptly at the limit of the Ni-Cu coating. The technique has been shown to work with numerous commercial aluminum and aluminum alloys, including Aluminum Association types 1050, 1100, 2024, and 3003.

In short, the method involves four basic steps: cleaning the aluminum surface; zincating the cleaned aluminum surface; electroplating a thin Ni-Cu alloy coating on the zincated surface; and Sn-Pb soldering.

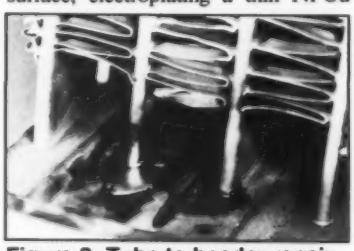


Figure 2. Tube-to-header repair on an aluminum automobile radiator. Tin-lead solder applied to defect after area has been cleaned, zincated, and brush-plated with nickel-copper alloy.

Using this procedure, several hundred soft-solder joints have been prepared using Ni-Cu-coated aluminum or aluminum alloy as the joining member(s)—aluminum to aluminum, aluminum to aluminum alloy, and aluminum or aluminum alloy to copper (no Ni-Cu coating) or brass. The solders consistently spread on the coatings, and the resultant joints have been consistently strong and stable.

For additional details of materials, reagents, and procedures, the reader is directed to previous publications or contact with the authors.

Properties of Soldered Aluminum

Rod-to-plate joint specimens of Ni-Cu-coated and Sn-Pb-soldered aluminum (type 1100) rod and plate were found to exhibit joint tensile strengths equivalent to those of copper or brass conventionally soldered using the same solders and fluxes.

The shear strengths of lap-joint specimens prepared by soldering sheet sections of Ni-Cu-coated a aluminum alloy (type 2024) were similar to the strength of soldered copper specimens (not coated) when the Ni-Cu thickness was ~0.6 μm or more.

The strength of aluminum alloy specimens brush-coated with ~2μm Ni-Cu alloy was approximately the same as that of specimens cell-coated to the same thickness. The shear ruptures of the aluminum alloy specimens always occurred either in the solder or along the solder-coating interface; there was no rupture of the coating-aluminum interface.

The strength of the AZ31B magnesium alloy specimens, included to illustrate versatility of the technique, was consistent with that of the aluminum alloy specimens. The AZ31B alloy was given a conventional thin copper "strike" after zincating to prevent reaction of the magnesium with the acetate electrolyte.

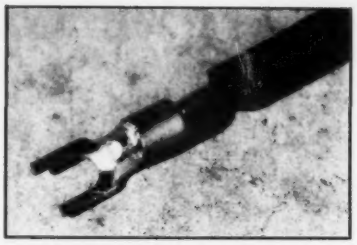


Figure 3. Copper conductor terminal soft-soldered to a nickel-copper-coated aluminum wire.

Aluminum and aluminum alloy substrates, when plated with Ni-Cu coatings and Sn-Pb soldered, exhibited good joint corrosion resistance. Coated and soldered (rosin flux) aluminum plates could be bent to ~90° C. without cracking or separation of the solder after exposure for one week at 60° C. in 100 percent humidity.

In contrast, uncoated plates soldered with active chloride-fluoride flux corroded badly at the aluminum-solder interface after the same exposure, resulting in solder cracking and separation even with little or no bending.

Alternate-immersion saltwater (3.5 percent NaC1) corrosion tests on Sn-Pb-soldered aluminum alloy 3003, with or without Ni-Cu coating, showed little corrosion effect on the solder. Without Ni-Cu coating, the solder separated from the aluminum, due to corrosion at the interface.

When Ni-Cu coated, no corrosion was evident at the interface and the solder remained tightly adherent. There was, however, indication of some pitting of the aluminum adjacent

Shear strength of tin-lead-soldered[1] lap-joint specimens

Substrate[2]	Ni-Cu thickness, μm	Coating method	Shear strength,[3] psi
Copper	0	None.....	8,400
Aluminum alloy..	.3	Cell.....	7,700
Do.....	.6	.. do.....	8,300
Do.....	1.1	.. do.....	8,200
Do.....	2.0	.. do.....	8,200
Do.....	2.0	Brush	8,300
Magnesium alloy .	1.0	Cell.....	8,200

[1]50-50 tin-lead; resin flux.

[2]Aluminum alloy type 2024; magnesium alloy type AZ31B.

[3]Average of six tests.

to Ni-Cu coating not covered with solder after nine days of this relatively severe test.

It was concluded that Sn-Pb solder joints formed in interior holes of Ni-Cu-coated aluminum radiator or other heat exchanger tubes should present no corrosion problems at interior surfaces. For the exterior solder area, covering the Ni-Cu with solder or water-resistant coating should retard any corrosion tendency.

Envisioned Use Areas

There are numerous potential uses for the Bureau's soft-soldering method, under patent application, involving fabrication or repair. Several firms have plating kits and/or chemicals available under license from the Department of the Interior. All reagents are prepared from commercially available ingredients. The solders and fluxes used are all standard formulations.

The technology permits the repair of aluminum automotive air-conditioning condensers and radiators, many of which have been discarded when leaks occur.

Several types of condenser failures have been repaired, including brazed-joint ruptures, cracked or split tubes, and corrosion holes induced by inclusions.

Numerous successful repairs have been made on aluminum radiators. Included have been tube closing and frontal repairs, and repairs of tube-to-header joints. Repaired radiators have undergone successful performance testing in the laboratories of two auto manufacturers and an antifreeze producer.

Bureau personnel are serving on a committee with representatives of the National Automotive Radiator Service Association and industry in the continuing validation testing of this technology for the repair of aluminum automotive radiators.

The growing acceptance of light aluminum radiators can be attributed to a large extent to the development of fluxless vacuum brazing for their initial fabrication and the devising of technology for their repair.

Aluminum electrical conductor wires have been used for a number of applications. The stability of connection joints has, however, been a constant challenge. The Bureau's soldering system has been used in the laboratory to join aluminum wires one to another and to copper terminals.

Work thus far has indicated that such joints exhibit desired low resistivity and that the resistivity remains linear over a substantial current-potential range, reflecting significant stability. Resistivity did not change significantly over about nine months, the maximum period evaluated thus far.

Another potential use area is soft soldering of copper tubing to aluminum panels for solar absorbers or other heat exchangers, where all copper components have been used because of inability to reliably solder copper to aluminum. Results of further research are expected to expand the number of new uses.

Summary and Conclusions

A technology has been developed that permits the soft-solder fabrication

Figure 4. Cross section of soft-solder joint formed between 1/2-inch-ID copper tube and 1/16-inch aluminum plate.

and repair of aluminum and aluminum alloy substrates and assemblies.

The process involves electrodeposition of a thin Ni-Cu alloy coating on the zincated aluminum substrate. This coating induces standard Sn-Pb solders to wet and spread when using standard fluxes. Solder joints so formed are relatively corrosion resistant and equivalent in strength to joints formed on copper or brass using the same solders and fluxes.

The Ni-Cu alloy (30 to 70 percent Ni) coating is electrodeposited from buffered acetate electrolyte by electrolytic cell (more suitable for initial fabrication) or by brush-coating (more appropriate for repairs).

The method has also been used to soft-solder aluminum and aluminum alloys to copper and brass.

In general, the process appears applicable for any reactive substrate that will accept an adherent Ni-Cu-alloy coating.

A variety of potential uses for fabrication and repair of items such as heat exchangers, electrical components, and energy conversion systems are envisioned for the soldering process. □

Tennis elbow

Continued from page 10

design for survivability and repairability in every shore facility. However, it should be mandatory for those facilities intended to support mission-critical functions.

Furthermore, I would suggest that those who find themselves assigned to or supporting a base public works department have very important mission. Certainly, the routine O&MN must be accomplished. However, and more importantly, assessment of and repairs to facilities that support mission-critical functions must be made. Something like a shot of cortisone to relieve tennis elbow!

What's the point? NAVFAC doesn't own the forward bases; fleet operators own them. However, OPNAVINST 5450.218 dated Sept. 5, 1986, describes the mission of NAVFAC (in part) as: "To provide material and technical support for shore facilities, real property, and utilities, fixed ocean systems and structure . . . as prescribed by the CNO . . ." NAVFAC is involved in the ownership of these facilities, even though it may not operate the facilities.

Those who work for NAVFAC, whether military or civilian, must consider themselves as part of the broader Navy team, with a mindset that says, "We own a piece of the elbow." If the "joints" in Figure 3 don't work or work only marginally well, those in NAVFAC are just as responsible as the base owners and operators. Even in the face of Gramm-Rudman, it is a joint responsibility to accomplish what is necessary to support shore facilities for the Navy.

In ultimate terms, it does not matter if one is really to blame, it is enough that one has failed. □

The asbestos nightmare:

From 'magic mineral' to invisible killer

By LT SHARON L. DISHER, CEC, USN
Assistant Resident Officer in Charge of Construction
Naval Facilities Engineering Command Contracts
Everett, Wash.

Asbestos has been named the cause of over 100,000 deaths due to occupational exposure alone in the past 60 years. From these same exposures, it is expected to cause at least another 350,000 deaths before all effects of the past 60 years are felt; these numbers reflect only those individuals exposed to asbestos in their work areas.

Asbestos was discovered in the stone ages where it was used in the making of pottery. Its properties of incombustibility, high tensile strength, chemical resistance, and ability to be woven made it the perfect substance for innumberable industrial applications.

Henry Ward Johns and C. B. Manville introduced the first full-scale manufacture of an insulating material made of plaster and asbestos fibers which had unlimited applications for use in steam-driven factories of their day. Despite Henry Johns' death in 1898 from a "chronic lung disease," the Johns-Manville Company was established in 1902 and played a dramatic role in the asbestos revolution turned nightmare in the 20th century.

The Johns-Manville Company continued to grow through the first quarter of the century by buying out asbestos mines, construction material firms, sound-proofing firms, floor-covering plants, insulation suppliers, and others. They revolutionized the construction industry in the early 1930s by making asbestos a primary building material for all types of construction. Asbestos was used in insulation, sheetrock, ceiling and floor tiles, caulk, spackling, motor casings, etc.

The company sponsored contests to develop new and creative ways to use asbestos and published a magazine call *Asbestos* to promote and advertise these new uses. Household uses such as draperies, convertible car tops, table covers, placemats, liners in washing machines, ovens, and toasters became popular. Powdered asbestos was sold as artificial snow for home use or in schoolyards as filler for sandboxes. Meanwhile, the Johns-Manville Company was making billions of dollars selling what they called "the magic mineral."

At the same time that the Johns-Manville Company was expanding the asbestos industry, the medical profession had taken a keen interest in the lethal effects of this "magic mineral." Although ill effects of asbestos are recorded as early as the first century, it was not until the early 1900s when the effects of asbestos truly began to be studied.

In 1931, a conclusive link between asbestos and death by pulmonary fibrosis or asbestosis (a disease which causes scarring of the lung tissue until it loses its capacity for air and causes the victim to suffocate) was identified. The British Parliament then made asbestosis a compensable disease and required improved methods of dust suppression and exhaust ventilation in asbestos textile factories. In the United States, however, despite the widely publicized effects of asbestos fibers on the human lung, the Johns-Manville Company and another large manufacturer of asbestos, the Raybestos-Manhattan Company, used their political clout to suppress publicizing information about the fatal effects of this "magic mineral."

Several studies during the next 20 years served to name asbestos as a

Asbestos worker inspects asbestos lagging on pipes once concealed behind wood walls.

source of lung cancer. Although these facts were well-publicized, the major asbestos companies along with the asbestos industries which had since developed were unwilling to acknowledge the relationship between asbestos exposure, asbestosis, and lung cancer.

In 1961, despite the hindrance of the asbestos manufacturers, inhalation of asbestos fibers was found to cause asbestosis and various types of lung cancer. These diseases were noted in asbestos workers and individuals exposed to asbestos fibers who lived near the asbestos factories or lived in the same household with an asbestos worker. Asbestos fibers easily become airborne, and once inhaled, remain in the lungs forever.

In October 1964, Dr. Irving J. Selikoff of the Mount Sinai School of Medicine, supplied the first incontrovertible evidence that industrial exposure of asbestos was hazardous. He documented that the combination of cigarette smoking and asbestos inhalation would greatly increase the chances of lung cancer.

Until Dr. Selikoff publicized his research results, the U.S. asbestos manufacturers had never publicly acknowledged the dangers of asbestos. They had never warned their workers of the potentially fatal conditions in which they were working. The Johns-Manville Company even had a confidential medical survey done in 1949 among their workers in one of their Canadian mines. The results of this survey indicated four workers out of 708 had normal x-rays. The rest of the worker's lungs contained varying degrees of mutations.

Asbestos lagging is removed from a pipe using the glove bag method.

Despite these results, the physician hired by Johns-Manville to do the study reported that "men have not been told of this diagnosis, for it is felt that as long as the man feels well, is happy at home and at work and his physical condition remains good, nothing should be said."

The asbestos manufacturers were not the only ones at fault when it came to promoting the use of asbestos. During World War II, asbestos use in this country's naval shipyards for the overhaul and repair of ships was quite prevalent. With the pressure to get the ships repaired and back to sea, the hazards of the asbestos being used in the repairs was of little concern or priority in the minds of government officials.

Complete ignorance of the asbestos hazard did not exist in 1943 as the Navy Department and U.S. Maritime Services published a booklet called "Minimum Requirements for Safety and Industrial Health in Contract Shipyards." The booklet warned workers that asbestosis could be contracted from any job in which asbestos is breathed. Although workers were warned, the effects of asbestos inhalation usually takes 20 to 30 years to become fatal. Since workers felt good and were secure in their jobs, they believed they had nothing to worry about.

By 1960 three million tons of asbestos were being produced annually worldwide. Dr. Selikoff's 1964 study marked a turning point in viewpoints on asbestos by medical and health care professionals worldwide. Publicity of this study forced the Johns-Manville company to place labels on the packages of their asbestos product warning users of its potential hazards. Still, limitations on the production of asbestos had not been established by regulation agencies or legislation.

Finally, in 1970, the Environmental Protection Agency and the Occupational Safety and Health Administra-

A glove bag full of asbestos lagging just removed from a pipe is sealed off and prepared for disposal.

tion (OSHA) were established and took the lead for setting regulating standards for the production of and exposure of asbestos by workers and the public.

In May 1971, OSHA established a limit of 12 fibers per cubic centimeter (cc) as the allowable standard for the work environment. This standard could be measured by taking samples of the air in the working environment with a special pump that filtered the air as it was collected. The filter material, after being chemically treated, would dissolve and leave the asbestos fibers visible for viewing with a special microscope. The fibers were then counted to determine the level of asbestos fibers in the air.

After continued publicity of the fatal effects of asbestos and additional studies which showed that asbestos workers have and eight times greater chance of dying from lung cancer than that of the general public, OSHA reduced its permanent standard for occupational exposure to asbestos from 5 fibers/cc to 2 fibers/cc. This new standard was to take effect in all workplaces containing asbestos by July 1976.

The EPA in April 1973 disallowed any visual emissions of asbestos when manufacturing, milling, or demolishing a building containing asbestos. They prohibited the sprayed application of any asbestos materials containing more than one percent asbestos. This prohibition did not include decorative materials, however, so wall coverings or textured ceilings could still be used by the construction industry.

Important to note is the fact that despite these "emission standards" required by the EPA, asbestos fibers are quite small and are impossible to see by the naked human eye unless they are in great concentrations. Limiting their elimination to only those that cannot be seen did not cure the problem. Any asbestos fibers that get into the lungs have fatal potential; the total existence or presence of any asbestos fibers should have been banned.

It was not until two years later, in October 1975, that the EPA finally included waste collection and disposal under the "no visible emission" standard. That same month, OSHA recommended lowering the occupational standard from 2 fibers/cc to 0.5 fibers/cc. In July 1976, when OSHA's 2 fibers/cc standard finally went into effect, the National Institute of Occupational Safety and Health (NIOSH), recommended that the standard be reduced to 0.1 fibers/cc. With increased public exposure of the hazards of asbestos, the regulating agencies were able to combat the pressure exerted by the asbestos manufacturers which had prevented or slowed the formulation of the standards initially. Today the acceptable occupational standard is set at .01 fibers/cc.

Asbestos siding is removed from a building by a team of certified asbestos workers.

Asbestos continues to provoke concern from public officials

By early 1979, the fatal effects of asbestos fibers were commonly known among the general public. In March 1979, the Environmental Defense Fund, a Washington, D.C.-based group, backed by the National Education Association, the American Federation of Teachers, and the National Parent-Teacher Association, petitioned the EPA to inspect 87,000 public schools across the nation for the presence of friable asbestos.

In response, the EPA notified state officials of the high levels of asbestos in public schools and began initiating an assistance program to help school officials recognize and control friable asbestos.

It was estimated that 15 million students and 1.4 million workers may have been exposed to loose friable asbestos in schools across the nation. The costs to identify and remove all the friable asbestos were astronomical. Detection costs alone were estimated at $60 million. Since Congress did not appropriate funds to remove the asbestos, the educators were left with the responsibility and little or no funds to take care of the extremely hazardous situation.

As a result of the high costs of asbestos removal, facility owners began to hold asbestos manufacturers liable for asbestos removal costs and for personal liability costs by workers exposed to asbestos over the past 45 years. By the beginning of 1985, the number of lawsuits that had been filed against asbestos companies was staggering. For example, 25,000 lawsuits had been filed against 30 companies by March 1985. One insurance company told Congress that anywhere from $40 to $90 billion dollars worth of product liability claims could be forthcoming and these figures did not cover the costs of litigation.

From "magic mineral" to invisible killer to causing billions of dollars in liability suits, asbestos continues to provoke strong concern from public officials, regulatory agencies, and the general public. The efforts continue to end the use of asbestos and eradicate its presence from our facilities. □

Clearing the confusion for those in post-government service

The conflict of interest statutes and regulations covering post-government service can be a source of misunderstanding and confusion among those of us in government service as well as those in a retired or former employee status. The regulations place a responsibility upon the active government employee, military and civilian, to ensure that we do not deal with the retiree or former employee who is constrained by statute or regulation from engaging in certain activities. The following identifies situations in which an ethics counselor should be consulted or in which further fact-finding may be warranted.

Selling by Retired Military Officers

The most frequently encountered area of confusion involves so-called "selling" activities by retired officers. Although there are numerous statutes and regulations covering these activities, the following summarizes the prohibitions with which both active and retired personnel should be aware:

(1) A criminal statute provides that for a period of *two years* after leaving the government, no retired naval officer may represent any person in the *sale of anything* (supplies, materials, or services) to the Department of the Navy. The maximum penalty for violating this statute is two years imprisonment and a $10,000 fine. With regard to reserve officers this prohibition applies only to those reserve officers having served 20 or more years on active duty.

(2) A civil statute provides for a loss of retired pay by retired regular officers when they sell supplies or war materials personally or for others to Department of Defense (DoD) agencies, the Coast Guard, National Oceanic and Atmospheric Administration, or the Public Health Service during the three years immediately following retirement. The sale of services is not prohibited under this statute.

"Selling" under both statutes is essentially any liaison activity with the purpose of ultimately concluding a sale. It should be noted that both statutes apply only to "selling" activities and only to retired military officers.

Representation by Former Military Officers and Civilian Employees

Another area that often give rise to confusion is that of "representational" activities. The following provide some guidelines for these activities:

(1) After leaving government service, former officers and employees may not "switch sides" to represent another person or entity on any matter in which the former officer or employee was *personally and substantially* involved while in government service. This is a lifetime prohibition. To participate "personally" means directly and includes the participation of a subordinate when actually directed by the former government officer or employee. "Substantially" means that the employee's involvement must be of significance to the matter. It requires more than official responsibility, knowledge, or perfunctory involvement.

(2) The other primary representational limitation pertaining to all former officers and employees involves a *two-year* representational prohibition on an individual's activities related to matters under the person's "official responsibility" during the last year of government service. "Official responsibility" is direct administrative or operating authority, whether intermediate or final. The scope of one's official responsibility is determined by those areas assigned by statute, regulation, executive order, job description, or delegation of authority.

As a general rule, unless a former officer or employee acts in either a "selling" or "representational" capacity, there is no statutory or employee or the active employee at risk. When a situation arises in which the circumstances suggest a violation of statute or regulation, you should consult your ethics counselor.

In addition to the "selling" and "representational" areas, there are other prohibitions on post-government activities for certain categories of former DoD officers or employees who performed a procurement function during the two-year period prior to separation. These individuals are prohibited from accepting compensation from a defense contractor for a two-year period after separation from government service. Further special rules apply to designated senior retired military officers and senior civilian employees. Questions regarding specific situations should be addressed to your cognizant ethics advisor.

Guidance Available

Detailed guidance on standards of conduct is contained in DoD Directive 5500.7 of May 6, 1987, and SECNAVINST 5370.2H of Oct. 24, 1984. The SECNAVINST is currently in revision and will be reissued later this year. In addition, the Office of the Judge Advocate General issues a comprehensive "Reference Guide to Employment Activities of Retired Naval Personnel," NAVSO P-1778 (Rev. 4-82). This publication is also being revised and should be reissued shortly.

Annual Inspection Summary:

Management Tool for Backlog Reduction

By BRUCE D. CROCKER
Public Works Support Branch, Facilities Division
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Va.

Do you spend time preparing an Annual Inspection Summary (AIS) for the purpose of satisfying a Chief of Naval Operations (CNO) reporting requirement? Do you throw it aside after meeting the "due date" and never pick it up again or use it? The following paragraphs discuss the purpose of the AIS and explain how it can be used as a tool to help public works (PW) managers spend maintenance of real property (MRP) resources wisely to reduce maintenance and repair backlog.

AIS—Vehicle for Justifying Increased Funding

The objective of real property maintenance and repair is to ensure that adequate facilities are available to support the Navy. Managing real property originates with the identification of all unconstrained work requirements. These requirements consist of recurring work, new work identified by inspections or by work requests, and work not accomplished previously because of lack of resources.

The minor and specific (labor class codes 06 and 07) maintenance and repair work requirements are translated into dollars and reported via claimants to CNO. The reporting document is the AIS.

The AIS is a "snapshot" (as of Sept. 30, 1987) of all valid maintenance and repair (M&R) facility deficiencies unfunded on that date.

This backlog, which consists of deferrable (DMAR) and critical maintenance and repair (CMAR) work as well as jobs within the funding responsibility of the claimant and activity, should be considered by the claimant in the budget process as subsequent years' funding requirements.

It is imperative that the activity's reporting of this backlog be accurate to ensure proper reporting of facility condition and budgetary requirements to higher echelon commands. (Increased MRP funding in recent years has actually resulted in a decrease in critical backlog for some major claimants in Fiscal Year 1987.) Accurate reporting also ensures the credibility of our backlog reporting with CNO and Congress.

The Navy's backlog continues to grow. This growth is due to: inflation, further deterioration of existing backlog, facility age, inadequate resources, creation of programs in recent years which have reduced funding available for maintenance (environment, energy, safety and health, historical preservation), and M&R requirements caused by new complex structures and building systems.

AIS—A Misnomer

"Annual Inspection Summary" is probably an inappropriate title for this annual snapshot of facility condition. True, it is a report that is done annually but it is not a summary of an annual inspection. It is a point-in-time listing of all unfunded M&R minor and specific work resulting from a scheduled, ongoing inspection program.

The primary source of input is the Control Inspection Program. This is the backbone of facilities management; however, major one-time M&R deficiencies identified through specialized inspections, preventive maintenance inspections, and operator inspections should also be reported. Facility condition ratings of C3 or C4 on the Base Readiness Report (BASEREP) must be supported by appropriate deficiencies on the AIS.

AIS Management Reports

New AIS reporting requirements to provide activities and claimants with information to generate useful management reports are outlined in OPNAVINST 11010.34B. With a reduction in MRP funds imminent, better management and use of funds may be achieved by use of these reports. The reports will also assist in directing funds to facilities in the proper investment categories (ICs) to help achieve the goals established by the CNO Shore Facilities Life Extension Program (Shore FLEP, OPNAVINST 11010.23E).

One method of identifying (and prioritizing) the condition of assets is by using a facility condition index (FCI). This index is calculated by IC as follows:

Facilities Deficiencies (CMAR or Total)
Current Plant Value (CPV) for the Facilities within IC

Figure 1 shows this calculation for a sample activity. ICs with high FCIs are readily identifiable. Activity FCI data may also be compared with major claimant averages or Navy averages. Figure 1 shows a CMAR FCI of .0723

This article is a recap of the ideas presented by the author to the members of the House Appropriations Committee, Survey and Investigations Team in April 1987. The team visited U.S. Armed Force installations in Europe including Naval Air Station Sigonella and Naval Support Activity Naples under the Commander in Chief, Naval Forces Europe (CINCUSNAVEUR) claimancy.

Author's comment: At some activities, inspections are performed at year end solely for the purpose of producing an AIS. This is usually due to a shortage of inspection personnel and/or a lack of management emphasis on the Control Inspection Program. At some activities, the desire to satisfy the customer is so strong that management allows customer work requests rather than inspection reports to "drive . . . the facilities management system.

By properly identifying the deficiency (and its cause), proposing the correct solution, estimating the job, entering the job into a facilities management system, ordering the appropriate materials and scheduling the job for accomplishment will, in fact, keep the customer happy. At the same time, the work will be accomplished in the most cost-effective manner and we will be spending scarce RPMA resources wisely. The keys to success of this system are management support and communication with the customer concerning job status. Concentrate on replacing a lot of work requests with control inspection reports thereby complying with OPNAVINST 11000.16A: "Inspection-generated work shall constitute a substantial portion of the work performed . . ." Also, the importance of a dynamic, continuous AIS cannot be overemphasized. Continually deleting authorized work and adding new work to the AIS, will always present a true picture of the backlog and only minor updating will be required for the Sept. 30 report.

and a total (CMAR and DMAR) FCI of .099. Compared to the claimant averages (.033 and .0571, respectively), this activity is worse than the claimant average (the higher the FCI, the worse the condition). The claimant should consider this when allocating MRP resources.

Also, it can be seen that the activity should concentrate funds in critical deficiencies in ICs 8, 15, and 7 to reduce the high critical backlog in those ICs. The activity should also strive to achieve the Shore FLEP goals.

This means placing emphasis on eliminating critical backlog in the high-emphasis ICs. Since the activity does not have facilities in ICs 1, 3, or 5 they should put a high priority on the critical deficiencies in facilities in IC 17 after 8, 15, and 7 (1, 3, 5, 15, and 17 are high emphasis).

To aid in prioritizing deficiencies within the ICs, a report showing FCI by facility has been developed. Since the activity only manages M-1 funds (used to correct DC-1 deficiencies) and Shore FLEP is primarily concerned with eliminating critical backlog, the report shows only DC-1 CMAR AIS deficiencies. Figure 2 is a sample report.

This report matches, by property record card number, DC-1 CMAR AIS deficiencies for each facility to the corresponding plant account (P-164) CPV and calculates an FCI. Facilities are ranked, worst FCI to best FCI, within IC and the ICs are ranked according to emphasis.

To achieve Shore FLEP goals, the activity should correct deficiencies in the facilities listed in the high-emphasis ICs (starting with the first facility listed in the IC and moving down) and then concentrate on the medium- and low-emphasis IC groups.

A similar report, showing CMAR and special project deficiencies, can be used by the claimant to help prioritize activity special projects to ensure that M-2 funds are spent in accordance with Shore FLEP goals.

These reports, while being extremely useful, do not (nor were they intended to) reflect total facility condition. Valuable facility information may be obtained by matching total AIS deficiencies for each facility to the corresponding plant account CPV and calculating a "total FCI." A sample report is shown in Figure 3. This report has two purposes:

- Facilities with high FCIs are readily identifiable. All facilities with an FCI greater than average (.05) are noted on the report by "Q." These facilities should be examined closely to ensure that the CPV is correct and the cost estimates for the deficiencies are correct. These facilities should receive immediate attention, particularly those considered mission essential and/or in the high-emphasis ICs. Also, as major deficiencies approach 50 percent of the CPV (.5 FCI), the activity should consider replacing the facility.

- This report highlights high-value, old facilities with no deficiencies. Facilities with a CPV greater than $500,000, greater than 20 years old

		%	CMAR Backlog				Total Backlog			
IC	CPV	CPV	DC 1	DC 2	Total	FCI	DC 1	DC 2	Total	FCI
4	2,290	2	2	105	107	.0467	26	105	131	.0572
7	2,429	2	27	254	281	.1157	193	254	447	.1840
8	623	1	0	304	304	.4880	59	304	363	.5827
12	3,899	3	0	333	333	.0854	94	333	427	.1095
14	74,953	60	47	5,299	5,346	.0713	572	5,897	6,469	.0863
15	3,227	3	0	860	860	.2665	52	963	1,015	.3145
16	16,532	13	48	451	499	.0302	838	451	1,289	.0780
17	8,474	7	10	815	825	.0974	274	1,093	1,367	.1613
18	11,684	9	98	321	419	.0359	154	622	776	.0664
	124,111		232	8,742	8,974	.0723	2,262	10,022	12,284	.0990
Major Claimant Data:										
	10523752		60901	286060	346961	.0330	136280	465097	601377	.0571

Figure 1

31 reserve officers graduate CECOS in March

Thirty-one reserve Civil Engineer Corps (CEC) officers—all members of Reserve Naval Construction Force (RNCF) Junior Officer Orientation (II) Class No. 1—graduated from the Naval School, Civil Engineer Corps Officers, Port Hueneme, Calif., on March 18, 1988. The class completed the second-level orientation course during a two-week active duty training period. The first course in Fiscal Year 1987 dealt primarily with Naval Construction Force topics; this course dealt with public works management and construction contracting. All of the graduates return to their reserve units upon completion of the training.

Guest speaker for the event was RAdm. David O. Smart, CEC, USNR, Commander, Reserve Naval Construction Force/ First Reserve Naval Construction Brigade.

Three class members finished with honors. Lt.(j.g.) James Sellner was the outstanding graduate; Lt.(j.g.) Elaine Huber and Ens. Gerald Snyder graduated with distinction. Lt. Sellner's photograph is in indicated by an (*), and those graduating with distinction by a (●).

* Lt.(j.g.) James Sellner
RNMCB-25, NTC
Great Lakes, Ill.

Ens. Mary Abell
RCBLANT, NAB Little Creek, Norfolk, Va.

Lt.(j.g.) George Anderson
RNMCB-18, NCBC
Port Hueneme, Calif.

FAC NO	PROP REC NO	FACILITY NAME	YR BUILT	UNIT OF MEAS(K)	CPV (K$)	DC-1 CMAR	PCI
R104	200017	GATE HOUSE	1850	.0PN	179.4	.0	.0000
RG	200043	B C Q	1919	3. PN	3048.0	.0	.0000
◆		---- IC 15 SUBTOT AVG AGE= 54			3227.4	.0	.0000
7	200617	SUB-STATION	1942	630.0SF	714.1	10.0	.0140
R450	20J067	ACTIVITY WAREHOUSE	1920	31.5SF	5.5	.0	.0000
	200068		1895	2281.7LF	1880.7	.0	.0000
	200069		1907	1382.0LF	[illegible]	.0	.0000
	200070		[illegible]	80.0KV	5.2	.0	.0000
	[illegible]	UTILITY VAULT	1940	12.5KV	5.2	.0	.0000
27	200603	WATER PUMP STATION	1917	51.0SF	145.1	.0	.0000
8	200618	SUB-STATION	1942	141.9SF	151.1	.0	.0000
	200630	FIRE ALARM SYSTEM	1966	5BX	383.0	.0	.0000
	200632		1968	75.0LF	46.4	.0	.0000
◆		---- IC 17 SUBTOT AVG AGE= 57			8474.0	10.0	.0012
4	200619	MATERIAL BUILDING	1944	1913.6SF	2428.5	26.5	.0109
◆		---- IC 07 SUBTOT AVG AGE= 44			2428.5	26.5	.0109
35	200605	PACKAGE STORE	1933	241.5SF	227.9	47.7	.2093
R464	200001	TENNIS COURT	1939	1EA	4.0	.0	.0000
R426	200021		1909	240.9SF	172.2	.0	.0000
RD	200030		1910	2853.6SF	2577.7	[illegible]	[illegible]
R448	200038	GREENHOUSE	1923	96.0SF	[illegible]	.0	.0000
R474	200064	TENNIS COURT	[illegible]	[illegible]	2447.4	.0	.0000
108	[illegible]	[illegible]	1933	588.2SF	823.0	.0	.0000
[illegible]	[illegible]	GYMNASIUM	1933	1664.3SF	1037.5	.0	.0000
116	200609	SWIMMING POOL	1937	1ME	1054.2	.0	.0000
13	200633		1952	369.3SF	.0	.0	.0000
◆		---- IC 16 SUBTOT AVG AGE=					

Figure 2

with no AIS deficiencies are noted. ("#" in column 6; see Property Record Card Number 20068). These facilities may require another inspection. Uncorrected deficiencies would be expected to exist at aging, high-value facilities unless the inspection program has failed to identify or report them. If repairs were recently made in the facility, then zero deficiencies may be expected.

All AIS deficiencies (CMAR and DMAR, DC-1 and DC-2) are shown in this report. This is done to show all deficiencies for each facility in relation to the value of the asset. It will not be possible, in some cases, for the activity to fund correction of all deficiencies due to inclusion of special project scope deficiencies.

As stated earlier, a comprehensive facilities inspection (Control Inspection) program is vital to successful facilities management. Early detection of deficiencies by qualified inspectors enables work to be programmed and accomplished in a timely manner, generally before major repairs or overhauls are required. Also, qualified inspectors can specify the proper materials, tools, equipment, and skills required so the work can be properly scheduled.

Another requirement of OPNAVINST 11010.34B is the reporting of inspection status. This data may be used to generate a report showing the status of the inspection program by IC for each discipline: structural, electrical, mechanical, roof, and other (elevators, boilers, etc.) A sample is shown in Figure 4.

This report shows an overall inspection coverage of 60.2 percent based on frequencies recommended in NAVFAC MO-322. Subtotals by discipline show weak coverage in the structural and mechanical disciplines. Low percentages may indicate a lack of time devoted to inspections in those disciplines or insufficient personnel.

Analysis shows the worst coverage exists in facilities in IC 8, 15, 18, and 4 for structural and IC 8, 15, 18, 4, and 14 for mechanical. This report shows areas that require increased attention by activity inspection personnel. In addition, activity percentages can be compared to major claimant percentages.

These management reports are currently being provided to CINCLANTFLT and CINCUSNAVEUR activities based on activity AIS data. As ADP support in PW becomes more commonplace, reports

FAC NO	PROP REC NO	FACILITY NAME	YR BUILT	UNIT OF MEAS(K)	CPV (K)	ALL OC ALL MAR	PCI	
2003	200258	TENNIS COURT	1948	2.0EA	21.7	13.5	.62109	209
R448	200038	GREENHOUSE	1923	1.0SF	27.0	13.0	.48098	91
35	200605	PACKAGE STORE	1933	2.4SF	333.0	99.9	.06626	189
107	200607	THEATRE	[illegible]	[illegible]	[illegible]	100.0	.05028	196
[illegible]	[illegible]	EXCHANGE GAS STAT	1940	1.8SF	219.2	11.0	.04948	97
R475	200443	EXCHANGE SERVICE STATI	1967	1.8SF	161.8	8.0	.0493	88
R426	200021		1909	2.4SF	172.2	49.9	.0360	176
109	200130	CHILD CARE CENTER	1933	9.2SF	1,387.1	32.7	.0315	180
115	200608	GYMNASIUM	1933	16.6SF	1,037.5	[illegible]	[illegible]	85
16	200600	EXCHANGE RETAIL STORE	1933	12.4SF	4,803.8	43.0	[illegible]	216
RD	200030		[illegible]	[illegible]	[illegible]	16.0		10007
13	200623	[illegible]	[illegible]	0.0	0.0	35.0		
[illegible]	[illegible]	KING STREET GATE HOUS	1940	0.0SF	5.2	0.0		
572	200638		1952	.4SF	0.0	0.0		
675	200653		1980	1.0EA	145.4	0.0		
40	200655	NAVY EXCHANGE MINI-MAR	1980	.8SF	59.8	0.0		
◆ IC 16 OTHER PERSONNEL SUPPORT			43=avg age		16,532.2#	1,288.8#	.0779	
R430	200067	ACTIVITY WAREHOUSE	1920	.3SF	5.5	4.9	.85866	93
	200271		1968	2.2LF	517.9	170.6	.32958	123
51	200273	UTILITY VAULT	1940	.8CU	2.9	1.1	.37931	137
52	200274	WATER POL STATI	1978	5.3LF	2,088.5	149.5	.07160	122
43	200272	WATER WELL/PUMPING STA	1940	0.0SF	296.7	12.4	.0418	198
27	200603	WATER PUMP STATION	1917	.5SF	145.1	5.7	.0393	190
	200071	COMBINED SEWER	1890	9.8LF	687.7	5.0	.0072	128
TUN NC	XXXXXX			0.0	0.0	24.4		120
TUNNEL	XXXXXX			0.0	0.0	64.0		112
	XXXXXX			0.0	0.0	278.0		10003
	XXXXXX			0.0	0.0	120.0		10008
	200648		1893	22.8LF	1,880.7	0.0#		
	200630	FIRE ALARM SYSTEM	1966	0.08X	383.0	0.0		
	200632		1968	.8LF	46.4	0.0		

Figure 3

IC	Structure COMPL	Structure NCOMPL	Structure %	Electrical COMPL	Electrical NCOMPL	Electrical %	Roof COMPL	Roof NCOMPL	Roof %	Other COMPL	Other NCOMPL	Other %
1	0	0	NA	0	0	NA	0	0	NA	0	0	NA
2	0	0	NA	0	0	NA	0	0	NA	0	0	NA
3	0	0	NA	0	0	NA	0	0	NA	0	0	NA
4	1	2	33.3	2	1	33.3	2	1	1	0	0	100.01
5	0	0	NA	0	0	NA	0	0	0	0	0	NA
6	0	0	NA	0	0	NA	0	0	0	0	0	NA
7	0	0	NA	0	0	NA	0	0	0	0	0	NA
8	0	4	0.0	3	1	0.0	3	1	75	0	0	NA
9	0	0	NA	0	0	NA	0	0	NA	0	0	NA
10	0	0	NA	0	0	NA	0	0	NA	0	0	NA
11	0	0	NA	0	0	NA	0	0	NA	0	0	NA
12	2	0	100.0	2	0	100.0	2	0	100.0	0	0	NA
13	0	0	NA	0	0	NA	0	0	NA	0	0	NA
14	4	4	50.0	4	2	66.6	3	1	83.3	0	0	100.01
15	0	2	0.0	2	0	100.0	2	0	100.0	1	1	0.01
16	17	12	58.6	23	2	92.0	20	1	95.2	0	0	NA
17	4	4	50.0	8	4	66.6	6	3	66.6	0	0	NA
18	3	7	30.0	0	4	0.0	0	4	0.0	0	0	NA
19	0	0	NA	0	0	NA	0	0	NA	0	0	NA
OTHER	0	0	NA	0	0	NA	0	0	NA	0	0	NA
SBTOT	33	37	47.1	44	14	75.8	48	11	78.4	1	1	75.01

Combined Struct,Elect,Mech and Roof

	COMPL	NOT COMPL	%
TOTAL	141	93	60.2
Major Claimant:	22183	7397	74.9

Figure 4

like these will be readily available for use by PW management personnel on a routine basis.

MRP funds are decreasing; however, the Shore FLEP initiative will continue as a CNO goal for reducing backlog. The challenge that faces PW management personnel now is to reduce emergency/service costs, eliminate unnecessary standing job orders, and reduce overhead costs (FMED/MCD and shops) so that additional activity M-1 funds will be available to accomplish minor and specific work that will reduce the backlog. Reports generated from the AIS will assist in management of these funds. □

Ens. William Barden
RNMCB-13, Poughkeepsie, N.Y.

Lt.(j.g.) Michael Briere
RCBC, NCBC Gulfport, Miss.

Ens. Emanuel Casas
RNMCB-13, Poughkeepsie, N.Y.

Ens. Richard Cook
RNMCB-14, Jacksonville, Fla.

Ens. Bruce Davidson
RNMCB-15, Kansas City, Mo.

Photo Not Available

Ens. Gregory Demetrius
RNMCB-20, Columbus, Ohio

Lt.(j.g.) Pete Demo
RNMCB-17, Santa Barbara, Calif.

Lt.(j.g.) David Olson
RNMCB-2, NS Treasure Island, San Francisco, Calif.

Ens. Bret Goon
RNMCB-16, Santa Ana, Calif.

• Lt.(j.g.) Elaine Huber
CBHU-9, Portland, Ore.

Lt.(j.g.) Mark Jenkins
RNMCB-25, NTC Great Lakes, Ill.

Ens. John Males
RNMCB-20, Columbus, Ohio

Ens. John McCarthy
RNCFSU-3, Columbia, S.C.

Photo Not Available

Lt.(j.g.) Jeffrey Means
RCECOS, NCBC Port Hueneme, Calif.

Lt.(j.g.) Robert Minchin
RNMCB-14, Jacksonville, Fla.

Lt.(j.g.) Vivian Modaver
RNCFSU-4, Bridgeton, Mo.

Ens. Danny Morley
RNMCB-24, Huntsville, Ala.

Ens. William Neville
RNMCB-14, Jacksonville, Fla.

Ens. Gerald Snyder
RNMCB-15, Kansas City, Mo.

Ens. Monte Scott
RNMCB-2, NS Treasure Island, San Francisco, Calif.

Ens. Vince Spaulding
RNMCB-27, Portland, Maine

Ens. Daniel Stably
RNCFSU-4, Bridgeton, Mo.

Lt. John Steinbeck
21st RNCR, Point Fields, Providence, R.I.

Ens. Robert Strahan
RNMCB-28, Shreveport, La.

Lt.(j.g.) Patrick Thompson
RNMCB-18, NCBC Port Hueneme, Calif.

Lt.(j.g.) David Varner
RNMCB-15, Kansas City, Mo.

Ens. Daniel Viau
RNMCB-25, NTC Great Lakes, Ill.

Ens. Art Whitson
RNMCB-18, NCBC Port Hueneme, Calif.

Concrete quality . . .

Continued from page 18

penetration with all of the problems discussed earlier. The low (<0.45) W/C desired is facilitated by the use of pozzolanic replacement of cement. A pozzolan is a material which has little or no cementitious value in itself, but when finely ground will combine with water and calcium hydroxide (lime) to form compounds having cementitious properties.

The replacement of cement by the pozzolan lowers not only the water requirement but the heat of hydration. Not only does pozzolanic replacement of cement increase strength in the long term but, more importantly, excess calcium hydroxide is removed from the concrete.

As calcium hydroxide is a major component in chemical recombinations with attacking agents such as sulfates, it is beneficial to remove as much of the excess calcium hydroxide as possible.

Two other considerations in the effort to keep the W/C low are water-reducing admixtures and air entrainment. The water-reducing admixtures increase the consistency of the mix without adding more cement and water. This provides a mix which is easy to place with less water, and therefore, less cement.

While the use of air entrainment is generally advocated for cold-weather climates where freeze-thaw cycles are encountered, air entrainment in the proper amount (6 percent) improves the flowability (placement) of the mix without adding water.

The use of the other types of cements (II and V) accomplishes two purposes: improving the sulfate resistance and lowering the heat of hydration. The improvement in sulfate resistance is an obvious advantage should the concrete be in a sulfate environment such as a seawall. Lowering the heat of hydration is an advantage as this lessens the incidence of surface and microcracks in the concrete caused by drying or thermal shrinkage, improving resistance to fluid penetra-tion.

Proper cover of concrete is usually accomplished by adherance to the concrete code, but a sufficient cover over resteel should be especially considered in an environment subject to agent attack. While the use of epoxy-coated re-steel is very popular in the United States, especially for bridge structures in Northern states where salts are used on the roads, this should never be considered a substitute for proper concrete mix design. No matter how well-intentioned the designer and fabricator, it is difficult to keep from removing a small portion of the coating from the resteel in the bending and placement processes. The optimum design in an area subject to considerable amounts of salts may be to use coated resteel in conjunction with a sound mix design.

The points considered for increasing the durability of concrete have dealt with design parameters and their impact upon the concrete. An important consideration is that no matter how well-designed concrete is, it must still be placed in the field.

The "real world" shows us that design performance changes considerably due to placement temperature and humidity, worker experience and skill, the quality control in the batch plant, and other conditions encountered in the environment. Proper management of these "field" parameters means the difference between performance as designed or some measure of failure.

In conclusion, a well-designed and placed concrete mix is the key to reinforced concrete's durability and therefore its strength in the long term. □

index 1988

FIRST SECTION

Summer 1987 (Vol. XXVII, No. 1)

VANDERKOOI LEE, Cynthia, USN — Instructor in the spotlight: SW1 (DV) Clifford A. Taylor, USN
AZAR, B. I. — Cementitious crystallization coating 'works' for waterproofing concrete swimming pools
TUEBNER, K. G., Lt., CEC, USN — Editorial: Government should decide price by risk amount
BUFFKIN, Mark D., Lt., CEC, USNR — Growing: The art of anti-terrorist engineering
EVEREST, Daniel — QA course provides the basics
MATSUSHITA, Gordon
TAKAHASHI, S. K.
MCTOMNEY, W. P., Cdr., CEC, USN (Ret.)
CHELAPATI, C. V., Ph.D. — Breakthrough for paperless data base at Pearl Harbor Public Works Center
Staff — Fourteen graduate basic class at CECOS
OKUMURA, Howard K. — New family housing inventory system makes more efficient plans and budgets
CRABTREE, Thomas R. — Current issues in the Real Property Management Field
BETH, Ruth — Navy couples benefit as CEC officer/GS engineer teams
DAMMEIER, Bruce F., Lt., CEC, USN — Full Seabee team effort essential in meeting 'needs of the fleet'
Unsigned — News worth reviewing
WINTERS, Philip R. — When engineers become managers
JONES, John Paul, Jr., RAdm., CEC, USN — Speaking from topside
KALEBA, Frank J., CEC, USN — Medical military construction program undergoes streamlining
THOMAS, Jerry — Lab research supports 'Bees
Unsigned — CBU-416 to install new child day care center at NSC Oakland
Staff — Index 1987

Fall 1987 (Vol. XXVII, No. 2)

ECKEL, S. L., Lt., CEC, USN — Navy contracts need network analyses
THOMAS, Jerry — New portable water well-drilling system here
FRASER, Jack, Lt.(j.g.), CEC, USN — Samoans welcome first Seabees since WW II
EVEREST, Daniel L., Jr.
BLANCQ, Stephen D.
YUEN, Stanford B. C. — A tabular format approach to service con-tract writing
Unsigned — News worth reviewing
FORT, A. W., RAdm., CEC, USN — Speaking from topside
YBANEZ, Robert E., Cdr., CEC, USN — The role of architects/engineers in construction contracts
SMITH, Michael — Vehicle barriers: A new tool to combat terrorism
WIELINSKI, Donna L., JOCS, USNR-R — Seabees use rodeo concept as training tool
CARPENTER, David — One approach to writing criteria
THOMAS, Jerry — Year of testing completed on first hybrid solar/wind energy system
MOSSEY, Christopher, Lt., CEC, USN — Inconsistent contract terminology: A problem in need of a solution
COLEMAN, David M., Lt., CEC, USN — Cost-plus award fee—A panacea?
LOMBARDO, Ralph — Advice of counsel
COLES, Christopher K., Lt., CEC, USN — 'Win-win-win' for AROICCs
FLEMING, Philip J., BU1, USN — Instructor in the spotlight: Ronnie E. Harvey
VAN DE VOORDE, J. R., Lt.(j.g.), CEC, USNR — The junior officer tour: A fast-paced 24 months!
Staff — Forty-three accept assignments in the field

Winter 1987-88 (Vol. XXVII, No. 3)

WONG, Leighton
KONNO, Stanley — Replaced PCB equipment could have prevented a contaminated shipyard
THOMAS, Jerry — NCEL scientists support Navy's readiness posture
Unsigned — Advice of counsel
Staff — Anchors at CBC Museum stir 'deep' mystery
CHITTENDEN, Richard E. — Contracting government services out: A growing problem or growing solution?
STEINBRUGGE, Richard L., Cdr., CEC, USN — Sixty-seven-year-old Pier J/K at NAS North Island gets major overhaul
Staff — Instructor in the spotlight: LCdr. Denny Fewell
THOMAS, Jerry — New facility at Port Hueneme to save Navy $300,000 annually
BUFFALO, John M., PH1, USNR — Landslide
YAROSCHAK, Paul, J. — Environmental management: Challenges and opportunities in the next decade
SHEAR, Greg, Lt., CEC, USN — A Seabee perspective of fleet hospital construction
LARSON, Michael — Navy minimizes/eliminates harmful asbestos exposure
GROSS, Kevin T., LCdr., CEC, USN — A history of Navy military underwater construction
Staff — Reader's survey

Spring 1988 (Vol. XXVII, No. 4)

Unsigned — Situation report
FRITCHEN, David R., Cdr., CEC, USN — United States Naval Reserve—A major factor in the total force equation
Staff — Instructor in the spotlight: LCdr. Marcus S. Kemper
FORD-BENSON, Carol, J.D. — Government versus A-E
Readers — Comments/questions
CORNFELD, B. A., JOCS, USN — Seabees restore monuments on Corregidor
LEWIS, Frank H. — Some lessons learned concerning A-E liability
SOLLENBERGER, Lee, Cdr., CEC, USN
DOLPH, James D. — Unearthed 19th century cannonballs stir memories of rich naval past
McELHANEY, Matthew K. — Advice of counsel
AVISOV, George B. — Ski lift at Bridgeport
THOMAS, Jerry — NCEL strives to curb noise pollution
MONTOYA, Benjamin F., RAdm., CEC, USN — Speaking from topside
AVOLIS, Kevin, Lt.(j.g.), CEC, USN — New road built in Iceland using gabion technique: initial reviews look good
ORTGIESEN, Randall G., Lt., CEC, USN
BETH, Ruth — Operation MINIFEX—Mission completed!
Staff — Seventy-three complete basic training at CECOS
LEE, Dennis J. — Developing a family housing maintenance specification

SECOND SECTION

General Features	Season	Page
Samoans welcome first Seabees since WW II	Fall	4
Anchors at CBC Museum stir 'deep' mystery	Winter	8
Seabees restore monuments on Corregidor	Spring	11
Unearthed 19th century cannonballs stir memories of rich naval past	Spring	16

Contract Administration

QA course provides the basics	Summer	9
Navy contracts need network analyses	Fall	2
A tabular format approach to service contract writing	Fall	5

index 1988

The role of architects/engineers in construction contracts ..... Fall 13
Inconsistent contract terminology: A problem in need of a solution ..... Fall 22
Cost-plus award fee—A panacea? ..... Fall 24
'Win-win-win' for AROICCS ..... Fall 27
Contracting government services out: A growing problem or growing solution? ..... Winter 9
Government versus A-E ..... Winter 8
Some lessons learned concerning A-E liability ..... Spring 14

Editorial

Government should decide price by risk amount ..... Summer 3

Energy

Year of testing completed on first hybrid solar/wind energy system ..... Fall 21
New facility at Port Hueneme to save Navy $300,000 annually ..... Winter 15

Environmental

Replaced PCB equipment could have prevented a contaminated shipyard ..... Winter 2
Landslide ..... Winter 16
Environmental management: Challenges and opportunities in the next decade ..... Winter 22
Navy minimizes/eliminates harmful asbestos exposure ..... Winter 27

Facility Construction

Cementitious crystallization coating 'works' for waterproofing concrete swimming pools ..... Summer 3
CBU-416 to install new child day care center at NSC Oakland ..... Summer 30
A Seabee perspective of fleet hospital construction ..... Winter 24
A history of Navy military underwater construction ..... Winter 28
Ski lift at Bridgeport ..... Spring 21

Facility Planning/Design

Sixty-seven-year-old Pier J/K at NAS North Island gets major overhaul ..... Winter 13
Medical military construction program undergoes streamlining ..... Summer 24
One approach to writing criteria ..... Fall 20

Management

Navy couples benefit as CEC officer/GS engineer teams ..... Summer 16
When engineers become managers ..... Summer 21

Military Readiness

Growing: The art of anti-terrorist engineering ..... Summer 9
Vehicle barriers: A new tool to combat terrorism ..... Fall 14

Public Works

New family housing inventory system makes more efficient plans and budgets ..... Summer 12
Current issues in the Real Property Management Field ..... Summer 14
New road built in Iceland using gabion technique: initial reviews look good ..... Spring 26
Developing a family housing maintenance specification ..... Spring 30

Research and Development

Breakthrough for paperless data base at Pearl Harbor Public Works Center ..... Summer 10
Lab research supports 'Bees ..... Summer 27
New portable water well-drilling system here ..... Fall 3
NCEL scientists support Navy's readiness posture ..... Winter 6
NCEL strives to curb noise pollution ..... Spring 24

Reserves

United States Naval Reserve—A major factor in the total force equation ..... Summer 3

Seabee Features

Full Seabee team effort essential in meeting 'needs of the fleet' ..... Summer 18
Seabees use rodeo concept as training tool ..... Fall 16
The junior officer tour: A fast-paced 24 months! ..... Fall 30
Operation MINIFEX—Mission completed! ..... Spring 27

Advice of Counsel

Unsigned ..... Summer 30
Lombardo, Ralph ..... Fall 26
Unsigned ..... Winter 8
McElhaney, Matthew K. ..... Spring 19

Index

Index 1987 ..... Summer 31

NAVFAC Report

Situation report ..... Spring 2

News Worth Reviewing

Summer 20
Fall 11

Reader's Comments/Questions

Spring 10

Readership Survey

Readership survey questionnaire ..... Winter 31

Schools/Training

Instructor in the spotlight: SW1 (DV) Clifford A. Taylor, USN ..... Summer 2
Fourteen graduate basic class at CECOS ..... Summer 12
Instructor in the spotlight: Ronnie E. Harvey ..... Fall 29
Forty-three accept assignments in the field ..... Fall 30
Instructor in the spotlight: LCdr. Denny Fewell, CEC, USN ..... Winter 14
Instructor in the spotlight: LCdr. Marcus S. Kemper, CEC, USN ..... Spring 7
Seventy-three complete basic training at CECOS ..... Spring 29

Speaking From Topside

JONES, John Paul, Jr., RAdm., CEC, USN ..... Summer 23
FORT, Arthur W., RAdm., CEC, USN ..... Fall 12
MONTOYA, Benjamin F., RAdm., CEC, USN ..... Spring 25

Have you heard about the Reserves?

For a challenging, rewarding career . . .

If you are a young construction professional in civilian practice or civil service, or are a graduating engineering or architecture college senior who has already selected a civilian career path, the Reserve Civil Engineer Corps may have a place for you as a commissioned officer.

Qualified young professionals have the chance to achieve tremendous personal and professional satisfaction through . . .

- Direct appointment as an ensign, Civil Engineer Corps, United States Naval Reserve
- Challenging assignments within Reserve Naval Construction Force units in your geographic locale, in areas paralleling active CEC duty in the Seabees or in facilities' management
- Annual active duty for training that is meaningful and rewarding
- Development of leadership and technical skills that will carry over directly into your civilian profession
- New and lasting friendships and associations with other top-notch construction professionals
- Pay and responsibility that increases as you grow and advance
- A Naval Reserve retirement package for a little something extra in your old age
- Finally, and most importantly, the pride in knowing that you are helping preserve the freedom of your country as your grow in your profession

Here's what you can do . . .

If you are a young engineer or architect, male or female, please call the Reserve representative listed below.

LCdr. Paul Donado
Southern/Eastern Region, RNCF
Naval Base
Charleston, SC 29408
Phone: (803) 743-2650/4322
AV 794-2650/4322

Lt. James Bolling
Central Region, RNCF
Bldg. 1, Naval Base
Great Lakes, IL 60088
Phone: (312) 688-6955/6
AV 792-6955/6

LCdr. Jerry Mason
Western Region, RNCF
1220 Pacific Highway, Bldg. 131
San Diego, CA 92132
Phone: (619) 696-5401/2
AV 958-5401

Or, contact an Active Duty EFD Accessions Officer listed on the inside front cover for further information and details . . .

CALL

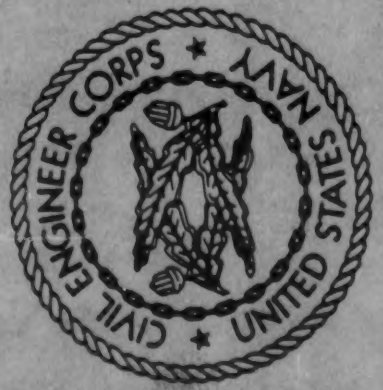
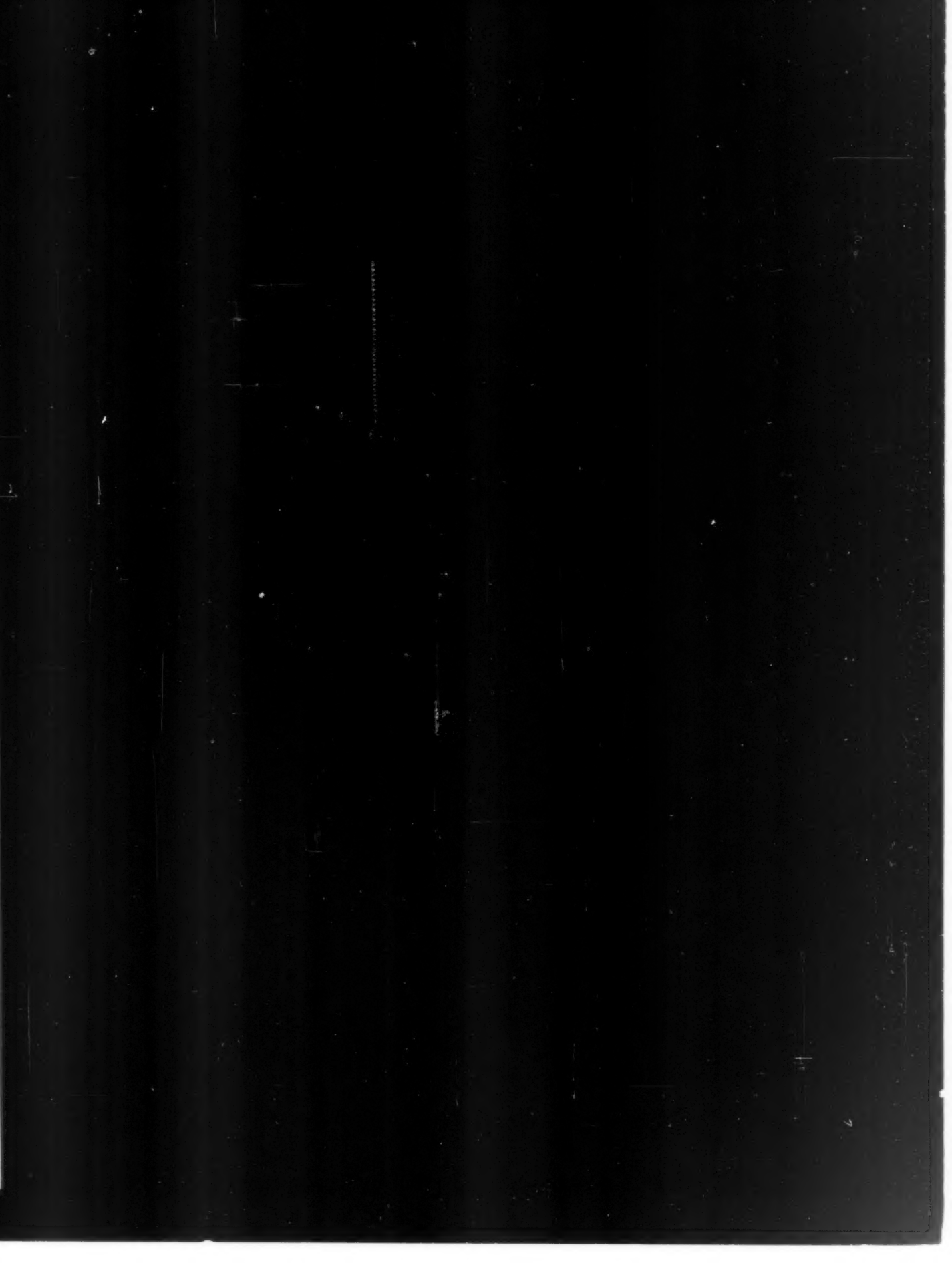
NOW

COLLECT

Navy Civil Engineer
Naval School, Civil Engineer Corps Officers
Code 20M
Port Hueneme, CA 93043

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

Second-Class Mail
Postage and Fees Paid
Navy Civil Engineer Corps
ISSN 0096-9419

NAVY CIVIL ENGR MAGAZINE (USPS 560-950)
I00037 0

UNIVERSITY MICROFILMS
SERIALS ACQUSITIONS
300 N ZEBB RD
ANN ARBOR MI 48106